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JUNE 83

COMPUTING INTERNATIONAL

The independent magazine for all Commodore computer uses

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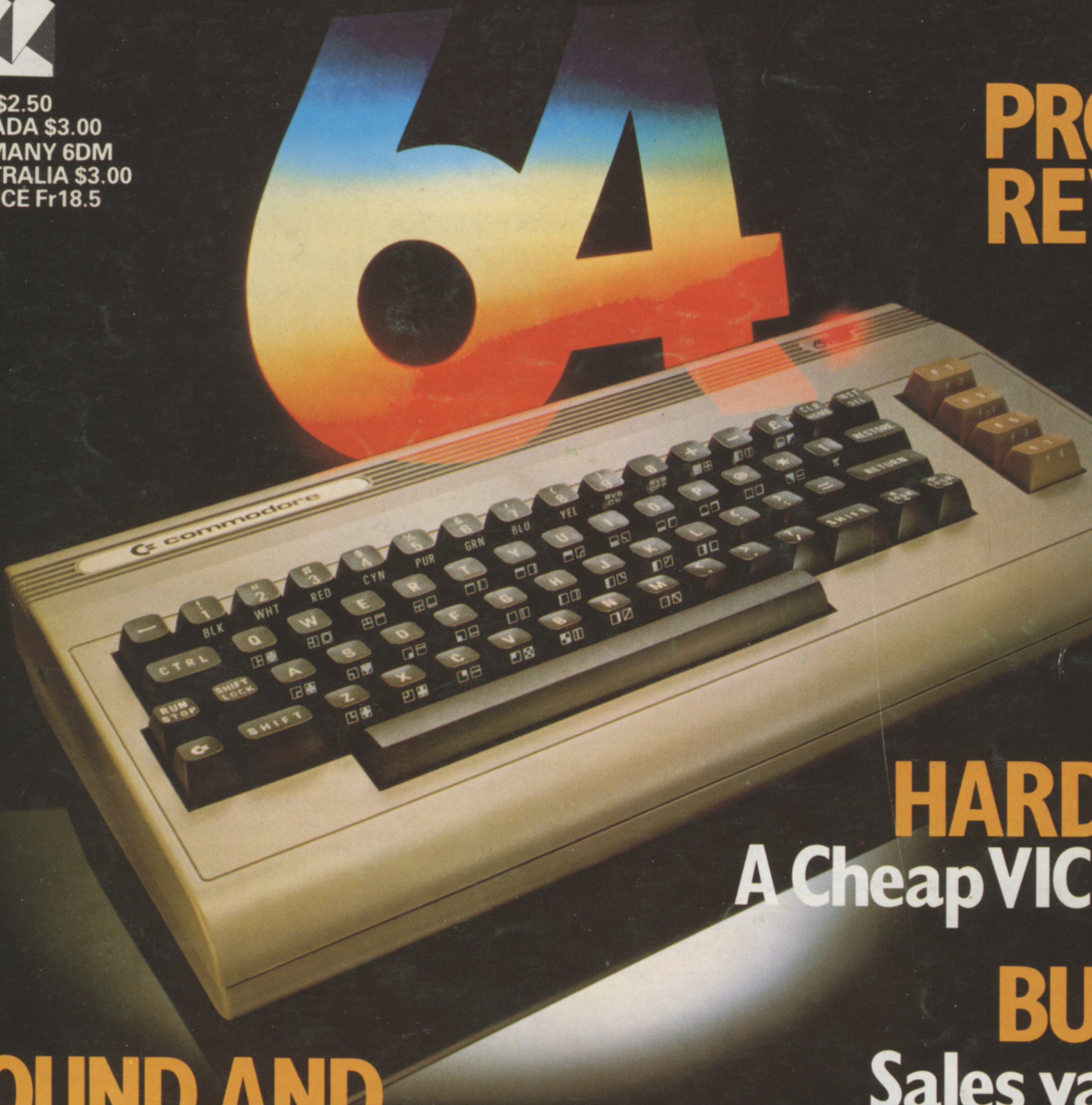

NEW PRODUCT REVIEWS

HARDWARE
A Cheap VIC Joystick

BUSINESS
Sales validation on PET

SOUND AND VISION
Music on the 64

PLUS
Pages & pages of Programme Listings

commodore SHOW GUIDE

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VIC 20/ COMMODORE 64 IEEE INTERFACE

Only £49.95 + VAT
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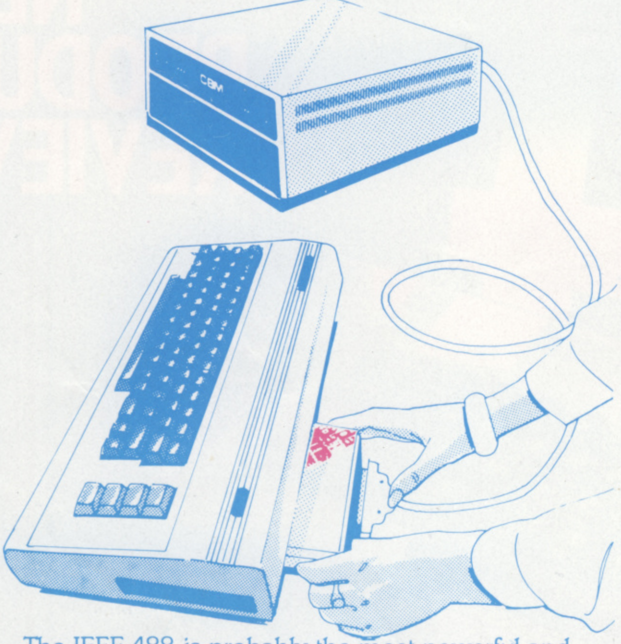

The IEEE 488 is probably the most powerful and flexible of all interfaces and at DAMS we have now harnessed it into a special cartridge, which plugs easily into the back of your VIC 20 or Commodore 64 computer, allowing for the connection of all peripherals previously associated with the PET range to the VIC!

This new and revolutionary step has enormous benefits for the scientific or educational user. Most electronic instruments can be interfaced, via IEEE to 64, and in a classroom situation up to 15 VIC/64 computers can be connected to one central disk drive.

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So, almost immediately, your 64 is transformed from a basic, home computer, into a sophisticated scientific and technical tool, with access to all PET peripherals, hard disk drives with up to 30 megabytes of memory, and up to 15 separate devices.

The IEEE automatically reconfigures the VIC 20/64 to input/output use, it allows simultaneous use of the VIC/64 serial bus, uses the standard PET/IEEE cable, and plugs directly into the VIC/64 memory expansion port. No software changes are necessary, and the cartridge comes with a full, 12 months guarantee for, only **£49.95 + VAT.**

COMMODORE 64, IEEE INTERFACE

The Commodore 64 version contains all of the benefits associated with the VIC 20, but also has:

- Automatically relocating code to allow plug-in cartridge programs.
- Reproduction of Commodore 64's memory expansion slot to allow you to use ROM based business software.

DAMS 12 MONTH GUARANTEE

DAMS Office Equipment Ltd. (hereinafter called the 'company') warrants the products it sells against defects in material and workmanship for a period of one year from the date of purchase.

During the warranty period, the company will repair (or at its own option, replace) at no charge, components that prove defective. This is provided the product is returned, shipping pre-paid, or by person, to Gores Road, Kirkby Industrial Estate, Kirkby, Liverpool L33 7AU, stating when it was bought and enclosing proof of purchase.

This Warranty does not apply if, in the opinion of the company, the product has been damaged by accident, misuse or misapplication.

ORDER YOUR IEEE BY POST!

Please send me ______________ (Qty) IEEE interface(s)
@ £57.44 each (inc. VAT + P&P) for my VIC/64*
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Address ______________
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commodore COMPUTING INTERNATIONAL

JUNE 1983

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NEWS

Hanover Fair

At the 1983 Hanover Computing Fair Commodore was able to produce evidence of some interesting and exciting projects currently under development. The most exciting of which is a portable version of the CBM 64. This machine, code named 'SX 64', will incorporate a 5" b/w or colour screen. The prices forecast for the new '64's' are put at approximately £1,000 for the colour version and £550 for the black and white.

Commodore U.S. is undecided on its marketing, there still being doubt as to whether they will release the new versions in this country.

Other new developments Commodore have decided to release in this country are their 'new streamlined' 8050 and 8250 disk units. Commodore have managed this 'streamlining' by incorporating Mashutita drives in low profile housing, their aim is to match the 7000 series. Throughout the Fair these disk drives were running German application software which appeared to be totally compatible with the other models present. To complete the range of hardware, Commodore were also displaying the prototypes of a new high-speed dot matrix printer and of a low cost daisy wheel printer.

For information concerning the imminent availability of these products one would advise the prospective user to apply to Commodore Business Machines themselves.

Another development Commodore hoped to keep a secret was their 'Mouse Cursor' for a low cost competitor to Apple's 'Lisa'. The leader of all Commodorophiles, CBM President, Jack Tramiel, was understandably vague on actual details. Keeping a wary eye on Apple, Commodore have been heard to mutter quietly to themselves about a possible home computer along these lines which will undercut Apple's 'Lisa' by a substantial margin.

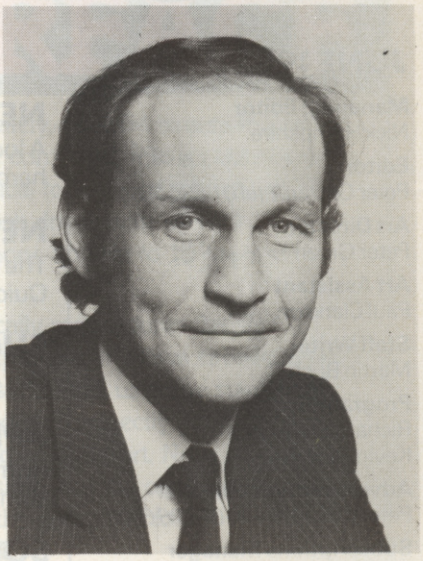
Jack Tramiel also predicted that 'speech technology' will within the next two years, have developed sufficiently to be included in the Commodore range—even to the point of having a 'Star Wars' type of personal robot.

Corby—Latest Update

Commodore have now released a communique to the effect that, as ever, their product availability will be erratic. However, Commodore have an infinitely justifiable reason this time. Their new production plant at Corby is underway. Commodore estimate the smooth running of their conveyor belt system to be in production by the end of June. This massive injection of new jobs and opportunities in unemployment stricken Northamptonshire is one wholeheartedly applauded by this magazine. The Plant at Corby will concentrate on the home computer industry allowing the Braunsweis Plant, in Germany, to expand production of the 500 and 700 series fourfold. With these two business moves Commodore expect, by the end of July 1983, to become more aggressive in taking a larger share of the market.

New Commodore Boss

In a letter to all Commodore Dealers, Robert Gleadow, at present Director/General Manager of Commodore Business Machines U.K. announced his departure from these shores. On June 1st he will take up the post of Vice President, Commodore Electronics Ltd in Hong Kong. So we take the opportunity here to wish Robert all the best and we are sure he will make a success of his new job.



We would also like to say 'Welcome' to Howard Stanworth, who on the 25th April took over from Robert, as Director/General Manager of CBM U.K.

Stanworth's previous management experience includes the Managing directorship of Excelsior Plastics (Wincanton Group Ltd), and Production Services Manager and General Manager (Service) within the consumer electronics activities of the Rank Organisation. He has also served as a Director of St Ivel Ltd and Managing Director of Unigate Dairies (Midlands) Ltd. In this capacity he had responsibility for over 3,000 employees involved in the processing and distribution of the company's products.

131% Rise in Sales

Commodore's massive concentration of effort into sales of popular home computers has been reflected in the barometer of the American way of life. Sales for the period ending March 31st were up to 131% at $189.6m. Commodore shareholder's earnings were up to a staggering $1.62 a share, as opposed to 71 cents.

The $88 Vic.

Our American correspondent informs us that some large discount stores are offering the Vic-20 at a new ultra low price of $88 (the comparable discounted U.K. price is $180). Also moving down in price is the CBM 64, now selling at $300. The 64 was recently reclassified by Commodore as a personal computer, and they are claiming sales in the U.S. of 70,000 machines a month.

NEWS

Interfacing Made Easy

INTERPOD
The Intelligent Interface for the Commodore VIC and 64
INTERPOD

Some people say that the effectiveness of the 64 in the business world is limited because it has no RS232 or IEEE interface and thus could not be used with a great range of business peripherals. It has also been claimed that users of the 4000 and 8000 series who wanted to supplement their system with the 64 could not do so because printers, floppy drives and hard disk units were not accessible.

All that is set to change with the arrival of Interpod from Oxford Computer Systems. This ingenious multiple interface houses both of the above mentioned interfaces while remaining completely transparent to both the 64 and the software. Because Interpod does not use the 64's cartridge slot, the Commodore's internal memory is not compromised and Oxford Computer Systems say that it is guaranteed completely compatible with the software.

The cost of this neat little system is £125 plus VAT, but Oxford do have one slight problem—they are looking for dealers to sell the unit. However, judging by the response from the USA and Europe—nearly $1 million of advance orders have already been placed—it should not be too long before Interpod itself becomes easily accessible to end users. For further information contact Oxford Computer Systems Ltd., Hensington Road, Woodstock, Oxford, telephone 0993-812 700.

Datarite to Make the T/830 Interface

The manufacturing rights to a computer interface for the Brother 8300 daisy wheel electronic typewriter, previously manufactured by a company called Systems of Tomorrow Ltd., have been acquired by Datarite Terminals Ltd. Called the T/830, the interface allows the 8300 to link to either RS232C or Centronics parallel computers. Under computer control, the operating speed of the printer is 12 characters per second and it accepts most word processing commands, so it can perform backspacing, bold type, underlining etc.

The cost of the interface alone is £175.00 which does not include VAT, although the Brother 8300 typewriters with the interface already installed are also available. Systems of Tomorrow Ltd. have gone into liquidation.

VIC-20 'Starter Pack'

Commodore Business machines (UK) Ltd have announced plans to launch their biggest ever promotion featuring the VIC-20 colour home computer.

Special Commodore VIC-20 boxed sets will be available in retail outlets and selected Commodore dealerships nationwide, officially from 1st June 1983. Designed particularly for the first time buyer of a home computer, for just £139.99 (including VAT), the limited edition packs will contain a VIC-20 computer, a cassette deck, Introduction to Basic Part I, and four cassette games: Blitz, Hoppit, Race and Type-A-Tune. (The current retail price of the items, if sold separately would be £249.99).

The Commodore VIC-20 is currently the most popular home computer in the world, with over 1.4 million sales to date. The machine is supported by an extensive range of peripherals, educational and games software.

Data Bill Unwieldly

The Computing Services Association is lobbying for changes to be made in the Data Protection Bill which is currently before Parliament. Should the bill become law, individuals will be further protected against misuse of personal data. However, the CSA claims that parts of the bill are cumbersome and unnecessarily bureaucratic.

Part of the bill requires that all organisations defined as data users should register every application that deals with personal data. This includes such vital business day to day activities as invoicing, share registration and payroll, and it is the possibility of having to register these activities that has provoked the anger of the CSA.

The CSA estimates that well over half the workload of the Registrar could be eliminated if the registration of these applications was not required. But wouldn't this provide a loophole in the bill? The CSA argue that the removal of this 'unproductive requirement' would not weaken the legislation but strengthen it because the Registrar would be given considerably more time for supervisory functions and investigating complaints more effectively, while leaving the unregistered application still subject to the full rigour of the legislation and the data subject having the same rights as those that apply to registered applications.

Anybody wishing to add their support to this cause should contact the Computing Services Association at Hanover House, 73/74 High Holborn, London WC1V 6LE, tel 01-405 2171/3161.

New Design C2N

C2N DATASETTE UNIT
Model 1530

Although it has been available in the States for quite some time now, the Commodore C2N cassette unit has only just been released over here, the only difference being that it now has a completely new design. The unit, which has been around since the launch of the PET, is compatible with the VIC-20, 64 and the complete range of Commodore's small business machines. Despite the new casing of the unit, the price remains unchanged at £45.95 including VAT.

Strengthen your hand with Superbase 64

The complete information control system for the Commodore 64. Ideal for any home, business or professional environment where records are kept. Create the format you need and enter your records. If the layout or data field sizes are not quite right, correct them and carry on. Superbase gives you an unrivalled range of powerful features including:

FLEXIBLE RECORDS

- ■Fully definable records with text, numeric, calculated result, date, constant, linking and key fields
- ■Record size up to 1000 characters
- ■Up to 128 items per record.
- ■Up to 4 screens per record
- ■File size up to 16 million characters

QUICK ACCESS

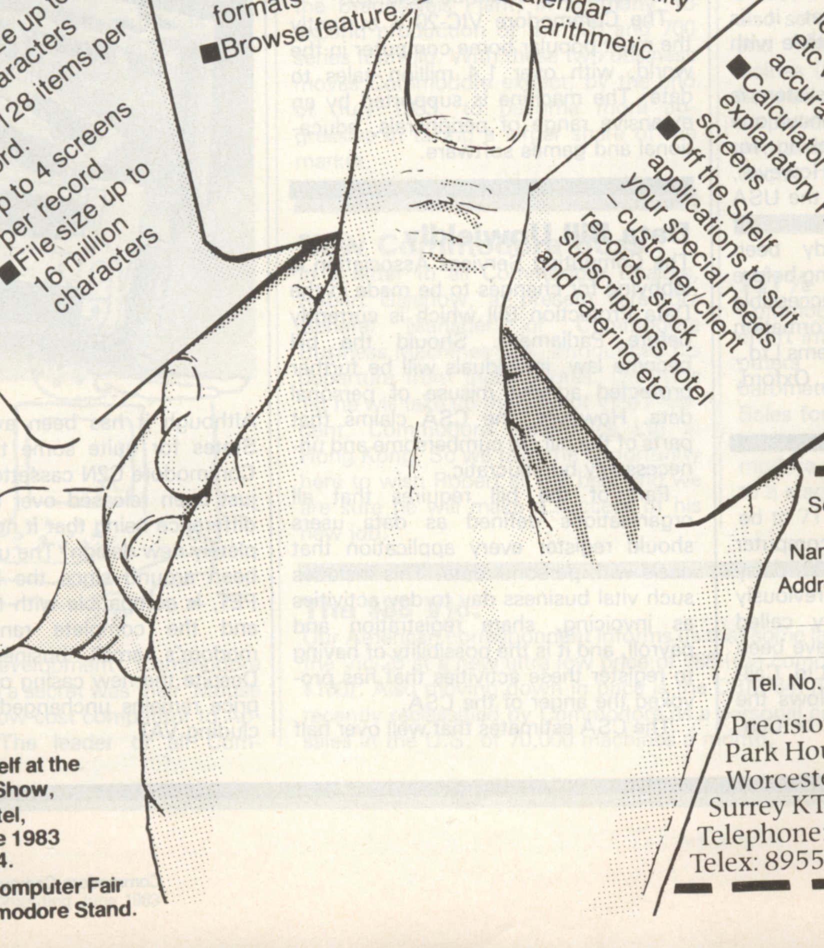
- ■Search, select from and sort names, dates, values
- ■Fast key access
- ■Search and select using multiple criteria
- ■Print, display or store selections
- ■Fully definable report and screen formats
- ■Browse feature

EASY AMENDMENTS

- ■Add or remove fields dynamically or alter their length with no need to rebuild files
- ■Completely redefinable records
- ■Full file update and delete facility
- ■Fast on screen recalculation of numeric fields gives genuine spreadsheet capability
- ■Calendar arithmetic

LINKS TO WORD PROCESSING

- ■Links to Easy Script word processor and Easy Spell for mailshots, letters, quotes, tables etc with 100% spelling accuracy
- ■Calculator and explanatory HELP screens
- ■Off the Shelf applications to suit your special needs records stock, customer/client subscriptions hotel and catering etc



OFFICIALLY APPROVED BY COMMODORE

Come and see for yourself at the Commodore Computer Show, Cunard International Hotel, Hammersmith 9-11 June 1983 on Stands B36 and B124.

Also at the London Computer Fair 16-19 June on the Commodore Stand.

Send me details of **Superbase 64** to:

Name

Address

CC

Tel. No.

Precision Software Limited
Park House 4 Park Terrace
Worcester Park
Surrey KT4 7JZ England
Telephone: 01-330 7166
Telex: 8955021 PRECIS G

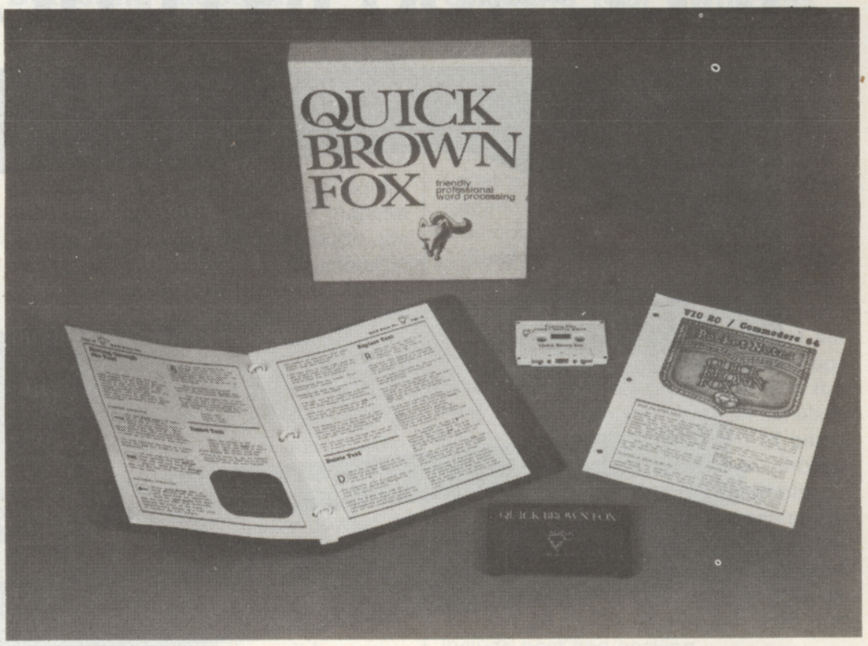
Precision Software

Full Editing with Quick Brown Fox

SPT Electronics Ltd. have produced a word processing system for the VIC-20 and 64. The cartridge for the processor costs £60 although for under £1000 you get software,computer, monitor and printer all thrown in. The system, called Quick Brown Fox, allows full editing and automatic reformatting of edited text. The data can be stored on cassette or disk.

Operating the system is as simple as ABC: the operator hits T for type, L for line edit, D for delete etc. and reformatting is accomplished by the hash sign followed by the appropriate letter, for example   J for justification.

Operating on the 20's 5K memory, the Quick Brown Fox has an inbuilt program which converts the VIC-20 to run on Centronics parallel, giving the user a wider range of peripheral equipment. The memory capacity of the system is 16K, the 5K being built up using increments of 4K. Hooked up via a modem or through the RS232 port, the Fox can send and receive information.



This particular aspect of the system is designed primarily for communication between Fox systems although it can work with other systems as well. Distribution is either by direct mail order or through a dealer network which is currently being set up. The system is available from SPT Electronics Ltd., Tollesbury, Essex CM9 8SE, telephone 0621-868484.

Hungary Exports Micro Disks

Bats-NCI Ltd have become the marketing agents for the MCD-1 micro-cassette disk system produced by the Hungarian company, Budapest Radio Engineering Factory. The MCD-1, which is exported by Metrimpex, the Hungarian Foreign Trade Company, is aimed at the personal computer market and is based on a single sided floppy disk.

There is an interlock mechanism to prevent accidental withdrawal of the cassette and the disk has a formatted capacity of up to 150Kbytes with a transfer rate of up to 250Kbits per second. It is for use on the PET and VIC. However, in order to use the cassette, you need to have the MCD-20 storage system which loads in the MCD-1 disk drive at a single touch and ejects at the flip of a button.

The MCD-20 gives you 0.5 megabyte of on-line storage and the system comes ready to plug in to the VIC-20 with either a single or double drive, power supply of 4.75 watts, interface connector, controller, operating software, instruction manual and one MicroDisk cassette per drive.

The cassette, which can hold up to 64 files which have a maximum of eight characters plus a three character suffix per file name, has 45 tracks. The MCD-20 is designed by Stein Mittell Ltd. The single drive system costs £180 pounds, the double £275. Any additional cassette costs £4 with quantity discounts.

Area: *Disk drives.*
Company: *Bats-NCI Ltd.*
Address: *Abacus House, 53-55*
Ballards Lane,
London N3 1XP.
Tel: *01-349 4511.*

Fast File Sorting and Processing

For all those Commodore users using the born again language CP/M, InfoStar is a file processor and business report generator produced by MicroPro International. The program can be put to use in fields as diverse as telephone listings and keeping track of sales.

The files can be split up into 32 categories and these can be sorted at a speed of up to 560 records per minute although the user may feel that 60 seconds is too long when generating a business report via the Quick Report feature. Information can be printed in bold type with underlining giving the finished product the polished finish. Such a report can have different information from different files and a similar facility is available when payments are being made.

The hitch is that unless you have a Softbox, InfoStar will not be of the slightest use to you. However if you do have a Softbox and you buy InfoStar, then you might as well make the most of its capabilities by adding MicroPro's DataStar and ReportStar, both available as individual packages. InfoStar should retail for less than £300.

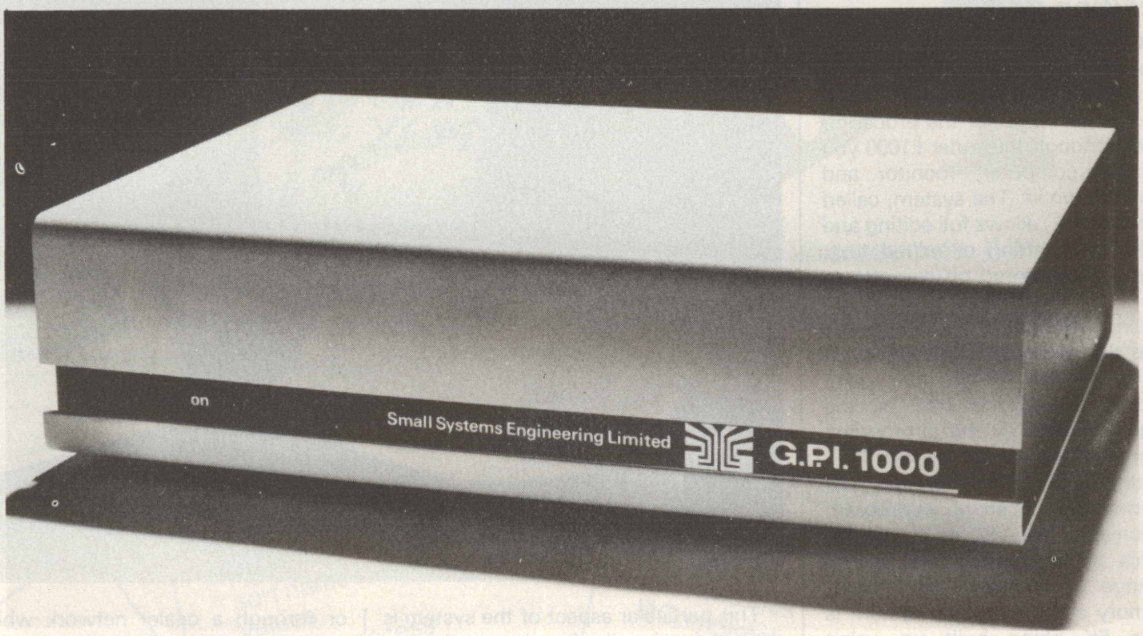
Area: *Business management.*
Company: *Microcomputer Products International Ltd.*
Address: *11 Cambridge House,*
Cambridge Road, Barking,
Essex IG11 8NT.
Tel: *01-591 6511.*

VIC Game Galore

Quicksilva have launched several new games for the VIC, whether the machine is expanded or not. Skyhawk is about a quiet European village that suddenly gets attacked and its special effects include scrolling landscape and aircraft status displays. For the VIC-20 with 3K or 8K expansion plus joystick.

Tornado looks like a different version of Scramble with attacking colony

TYPE GP1 1000
IEEE-488 INTERFACE



The GPI is a Z80 microprocessor based bidirectional IEEE-488 to RS 232C interface capable of buffering up to 59K bytes of input data. Buffering input permits operation with high speed input devices and also allows use of the PET's BASIC INPUT statements. Baud rates, code conversion and other operating parameters are software selectable using PET BASIC.

Specification:
IEEE-488 FUNCTIONS: Source Handshake (SH), Acceptor Handshake (AH), Talker (T), Listener (L) and Extended Listener(LE).

Switch Selectable Options:
Listen address, Talk address.

Software Selectable Options:
Baud rate through the range 50 to 19200 baud, Parity, Stop bits, Data bits, Data input mode, Code conversion, XON/XOFF and separate input output baud rates.

RS 232C Signals:
Received data, Transmitted data, Request to send, Clear to send, Data set ready, Data terminal ready.

Packaging:
The GPI is housed in an attractive instrument case with a U.L. approved external mains plug power supply.

Dimensions:
270mm, 65mm, 200mm. Weight Approx 1Kg.

Prices:

GPI/(1K Buffer)	£275	GPI/(15K Buffer)	£495
GPI/(2K Buffer)	£290	GPI/(32K Buffer)	£525
GPI/(4K Buffer)	£320	GPI/(59K Buffer)	£575
GPI/(8K Buffer)	£375		

Options:
20mA current loop input/output £25.
1K byte input buffer increments above standard sizes £15 per 1K increment.

Cables:
Please note the GPI now comes as standard with a PET type IEEE-488 port edge connector and a female 25 way "D" type socket.

IEEE-488 cable with stacking connector	£28
GPI.IEEE-488 port to stacking connector	£25
RS 232 Terminal cable.	£15
RS 232 Modem cable.	£15

New Product . . . GPI SC
The GPI SC is a version of the general purpose interface programmed to function as an IEEE-488 bus controller which can be driven by Standard RS 232 C (V24) devices such as computers, terminals, modems etc. £475

Warranty
90 days against defective workmanship or component failure or under normal operating conditions.

All prices are ex VAT

small systems engineering limited
2-4 Canfield Place, London NW6 3BT. Telephone: 328 7145 Telex 264538

fighters and installations on the ground below. That one is for the unexpanded VIC with joystick.

Harvester is for the unexpanded VIC and allows two to four players at a time. Pixel Power must have 8K RAM or more, the package supplying you with features such as Create, Save, Amend and View Set. However, probably the best value for money comes from Trader, a trilogy of 16K programs that combine to give an epic graphic adventure.

Also with 16K comes Starquest which is a 'voyage of discovery and adventure in the cosmos,' and the IQ game called Encounter. The prices of these vary from £5.95 to £14.95 and they are all on cassette.

Area: *Games.*
Company: *Quicksilva Limited.*
Address: *Palmerston Park House,*
13 Palmerston Road,
Southampton SO1 1LL.
Tel: *0703-20169.*

Olivetti Praxis Prints and Types

The Cambridge firm of Control Universal are currently distribution agents for the Olivetti Praxis 41 printer/typewriter. Included in the price of £495 is a choice of either serial or parallel interfaces, which means that the Praxis is compatible with almost any micro.

The printer operates on the daisy wheel principle and interfaces into the computer via an adaptor but it is only the serial version which has a separate numeric keypad and has the facility to receive and transmit data. As an electronic typewriter, the 41 has 100 characters, 17 function keys and an acoustic cover to reduce noise. As a computer printer, the Praxis can reproduce documents at the speed of 120 words per minute.

Area: *Printing.*
Company: *Control Universal Ltd.*
Address: *Unit 2, Anderson's Court,*
Newnham Road, Cambridge
CB2 9EZ.
Tel: *0223 358 757.*

Detecting Hiccups in the Mains

Have you ever had your computer malfunction or lose data because of mains interference, transients or noise? Momentary interruptions occur frequently on the power supply and can play havoc with any electronic equipment. Losing data must be guarded against at all costs and although the Sentry will not prevent fluctuations in the power supply it will detect transients and indicate that they habe occurred.

This portable monitor unit will plug into any standard 240V A. C. socket and monitor the quality of the electrical supply. The transient can be detected at three different levels indicating slight, moderate or severe interference. The distinction of severity is not based on the level of the power supply flowing at the time of transience but on the length of time that the interference occupies, and a number of lamps are lit indicating the severity of the interference. These lamps remain lit until the unit is reset.

The Sentry can be used to monitor different supplies to see which is best, check 'on-site' supplies and identify equipment which generates noise. This portable monitor can be obtained for £45 plus post and packing and VAT.

Area: *Power units.*
Company: *Mektronic Consultants.*
Address: *Linden House, 116 Rectory*
Lane, Prestwich,
Manchester M25 5DB.
Tel: *061-798 0803.*

Agriman Programs Monitor Farming

Agricultural Computing Services, who are official Commodore dealers for the Agriman series which are currently available on the 8000 series, say that there are plans to make the series compatible with the 700 although no final production dates have yet been set. There are several programs available in the series, namely Agriman, Beefman, Cropman, Dairyman, Pigman and a payroll program called Bonus which looks after weekly and monthly paid staff, tax, National Insurance and Statutory Sick Pay. Bonus is designed to be used in conjunction with Agriman.

Area: *Agriculture.*
Company: *Agricultural Computer*
Services.
Address: *Roundabout Farm,*
Thurning,
Norfolk NR20 5QS.
Tel: *0263-860847.*

Cultivate Your Own Peas

Garland educational software for the PET consists of several programs available in cassette form either for demonstration by the tutor in a lecture or for self-tuition by the student. Whether you are interested in educational programs or not, you must give Garland 10 out of 10 for the ranges that they cover.

Seed Germination allows the operator to study the effects of the environment by varying water, light, oxygen and temperature, the results appearing via animated graphics, a facility which applies to all the other programs. With the Hybrid Cross program you can simulate an experiment in the crossing of peas, the operator being allowed to choose the genotype of prospective parents.

Using these programs, one can study the wonderful world of genetics, inheritance, livestock..... the list is almost endless. The price per cassette goes all the way up to £32.45 and that does not include post and packing.

Area: *Education.*
Company: *Garland Computing.*
Address: *35 Dean Hill,*
Plymouth PL9 9AF.
Tel: *0752-41287.*

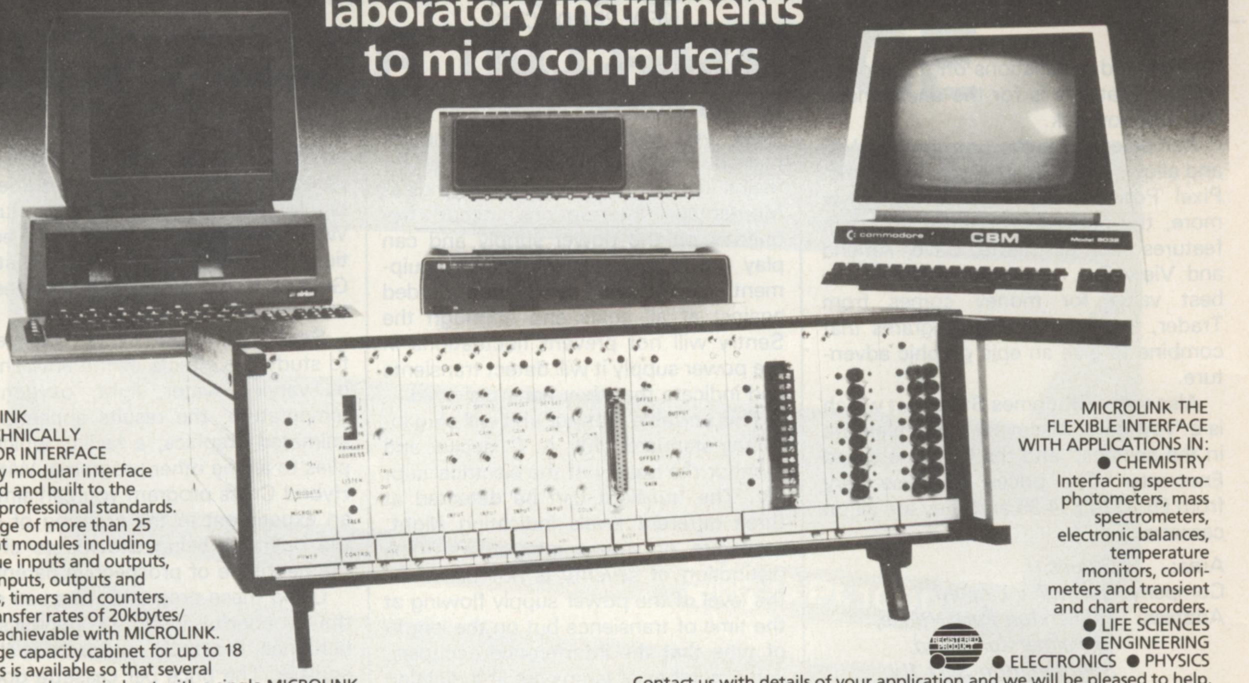
Security Units for the 8000

There is a new security system for the 8000 SK series which is designed to be used in conjunction with Pet-Speed. That even if the software is copied it cannot be run without the hardware unit. Called Safeware, the combined hardware/software package has a user port plug-on unit and to make sure that there are no connecting slip-ups there is a routine which can be put anywhere in the program as many times as needed to make sure that the unit is actually present.

Without the unit, the program will not run, the computer is reset and the Basic memory area wiped clean. What makes this product secure is the fact that each unit is given a unique code and no two Safeware packages are the same. This package, which allows software to be loaned or hired, costs £24 which includes postage and packing but not VAT.

Area: *Security.*
Company: *Mektronic Consultants.*
Address: *Linden House, 116 Rectory*
Lane, Prestwich,
Manchester M25 5DB.
Tel: *061-798 0803.*

The MICROLINK INTERFACE links a wide range of laboratory instruments to microcomputers



MICROLINK
THE TECHNICALLY
SUPERIOR INTERFACE

- A fully modular interface designed and built to the highest professional standards.
- A range of more than 25 different modules including analogue inputs and outputs, digital inputs, outputs and controls, timers and counters. Data transfer rates of 20kbytes/sec are achievable with MICROLINK.
- A large capacity cabinet for up to 18 modules is available so that several functions can be carried out with a single MICROLINK.
- Full software support and programming manuals for CBM, Hewlett Packard and Sirius.
- Competitive pricing – 32 analogue inputs and 8-bit analogue to digital conversion for about £650.00 and 16 thermocouple inputs and 12-bit analogue to digital conversion for under £900.00.
- Whole systems can be supplied including the MICROLINK, computer, peripherals and software.

MICROLINK THE
FLEXIBLE INTERFACE
WITH APPLICATIONS IN:

- CHEMISTRY
Interfacing spectrophotometers, mass spectrometers, electronic balances, temperature monitors, colorimeters and transient and chart recorders.
- LIFE SCIENCES
- ENGINEERING
- ELECTRONICS
- PHYSICS

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Sales literature and prices from:

Biodata Ltd.,
6 Lower Ormond Street,
Manchester M1 5QF, U.K.
Tel: 061-236 1283

Biodata

Does Friday give you a Monday morning feeling?

If you are responsible for payroll we can alter your life! We will make Friday the day you look forward to, rather than the day you dread.

More and more companies are finding that running their payroll is a pleasure with the payroll program that gives new meaning to the overworked phrase 'user friendly'.

The name of this program is PAYROLL 2 and it runs on the Commodore CBM 8000 and 700 computers.

We won't tell you more about it here, other than to say, it would make very great sense to ensure you see a demonstration of this remarkable program before purchasing a payroll package. It would be highly frustrating to purchase another and then become aware of the PAYROLL 2 excellence afterwards.

*** Yes - it will assist with the dreaded SSP ! ***

The price for transforming your Friday is just £375 + VAT.
The hardware will cost about £2300 if you don't possess it.

FROM YOUR COMMODORE DEALER or contact:

LandSoft 28 Sheen Lane London SW14 8LW Tel 01-878 7044

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COMPUTING
INTERNATIONAL

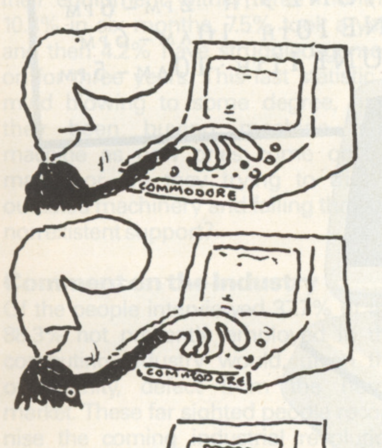
HOME COMPUTING SURVEY

At the end of April in London, Commodore Computing International conducted a survey of personal computer users. The past three years have seen an incredible upsurge in the use of computers with over 1 million personal computers sold to date.

Choice Machine

A list of twelve of the more popular home computers were compiled into the survey, these include the 'Spectrum,' the 'BBC Acorn' and the 'Apple.' The CBM Vic-20, CBM 64 and the CBM Pet collectively scooped 29.14% of the home computers owned and used by the 360 interviewees. The nearest leading rival to this was the Sinclair ZX81, taking 25.8%. Following closely was the Sinclair Spectrum with 22.5% and then the BBC Acorn with 18.34%.

One may point out here – and I do so – that collectively the Sinclair machines scooped 44.3% of the ratings.



This is indicative of the current economic climate. At present Sinclair leads the field with his low cost relatively efficient computers but should Commodore lower their prices in this country, Sinclair may find himself with a more realistic battle on his hands.

Middle Age?

Consider the age of the home computer owner.

How many times, increasingly, has one heard a young person (10-20 years old) brag "I've got a computer!" etc? Put them all together and one would justifiably think that they were the majority of owners. No so! According to the results of the survey the prime age of home computer owners is the 20-30 age group with a rating of 37.5%. Then following them is the 30-40 age group with a rating of 21.7%.

The 10-20's group hold 20.8% of the ratings but who pays for the computers owned by the under 20's? Presumably the parents in most cases, these parents are themselves generally in the upper 40's bracket.

So the conclusions we draw from this is, that although the younger people are hitting the headlines, it is the middle and upper aged groups that are supporting and advancing the industry. The young people themselves represent the future of the industry.

Value

Over 31% of interviewees had bought their computers within the last six months. Indicating perhaps that the industry is moving faster than most had supposed.

The mean average total of expenditure per month coming to the staggering figure of £29.84 per person. Since over 1 million machines have been sold this indicates that the U.K. personal computer market now has an annual turnover of about £300,000,000. From the results of the question "What do you use your computer for?" it would seem that most of it is spent on computer games, the percentage for this being 61.7%. Education tied with Graphics for second choice with a rating of 35.8% in favour of Graphics and, just slightly less, 35% for Education.

In answer to the question "Will you be buying a new computer in the future?", owners of machines indicated that they would indeed be buying a new machine soon. The figures here being 75.8% in favour and 24.2% against. Encouraging news for computer manufacturers or an indictment on their current models?

Home v College Education

Here we enter the tricky area of standards. We have found that schools and colleges will be buying more machines, but does the tuition come up to scratch? It would seem not if one believes that 38.3% of interviewees were learning computing in a formal institute of education and of these only 58.7% are happy with the standards of instruction.

On documentation 69.2% are dissatisfied with the standard of manufacturers' support literature. Many of the remaining 30.8% confided that they had used other, independently authored material.

The indications of these findings would seem to be a thumbs down for manufacturers and a hint that really they could do much, much better (after all they DO make the damned things).

Programmes

The practice of printing computer programmes within the computing magazines on sale, was given overwhelming praise from the interviewees. 73.9% interviewed said they used and found the programmes very useful, the remaining 26.1% found it labourious to type in the programmes but admitted that they would welcome the programmes if given in a more accessible manner.

38.2% of users were satisfied with the programmes on the whole but the remaining 61.8% felt that the standard of programmes could be improved greatly.

Items to View

The results gained from the answers to the question "What do you want to read in magazines?" are indicative of the hunger for knowledge that exists amongst computophiles.

Heading the ratings are Reviews with 80.8%, Ads with 72.5%, Programming Tips with 69% and New Products

A feast for everyone interested in computers.

We're preparing a mouthwatering spread for our 4th International Computer Show at the Cunard Hotel.

Over 120 exhibitors from Britain, Europe and the U.S.A. will be there. Which makes this show the biggest ever mounted in Britain by one computer manufacturer.

On display will be the complete range of the latest Commodore hardware.

That's just for starters.

Then there's a vast selection of software including the latest packages for use at home – and at work.

Plus, of course, all the printers, plotters and disk drives you'll ever need.

£3,000 WORTH OF EQUIPMENT TO BE WON

As well as all this, we're giving away £1,000 worth of computer systems in our daily competition.

Admission on the day costs only £1, or £2.50 for a family ticket.

Post the coupon now and we'll give you your tickets half price.

So do it now.

After all, feasts like this usually cost far more than 50 pence.

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THE CUNARD HOTEL
HAMMERSMITH · LONDON W6 8DR

HARDWARE

An appetising array of exciting new products, portable and hand held computers, colour and daisy wheel printers and full colour monitor. And of course the VIC 20, Commodore 64, 8000, 500 and 700 series.

SOFTWARE

A carefully chosen selection including not only games but also CAD/CAM, information retrieval, spread sheets, word processing and a whole range of educational software. Everything you'll need for business and the home.

AND MORE

A great range of disk drives, printers, plotters, monitors and games accessories – the perfect accompaniments to the above.

THE COMMODORE 4TH INTERNATIONAL COMPUTER SHOW

THURSDAY JUNE 9TH · 2PM – 6PM
FRIDAY JUNE 10TH · 10AM – 6PM
SATURDAY JUNE 11TH · 10AM – 5PM

commodore
VIC 20

I am interested in Personal Computers □ Business Systems □ Education □ (please tick).
Please send me the following:

(Quantity) of adult tickets at 50p each

(Quantity) of family tickets at £1.25 each

(A family ticket covers parents and their children)
Please make cheques/Postal orders payable to Commodore Business Machines (U.K.) Ltd.

Post to: The Commodore Information Centre, Dept. CS, 675 Ajax Avenue, Slough, Berkshire SL1 4BG. Telephone Slough (0753) 79292.

Name
Address

Postcode
Telephone

If you can't attend the show but would like further information on the Commodore Computer range just fill in the form above.

CSCC00583

Commodore computing international home computing survey

Reports with 61%. Such is the rate that computers and their peripherals are expanded and improved on that incidentals such as learning how to use the equipment comes a poor fifth and sixth in the race to be ahead of every one else.

The reviews and advertisements rate significantly in the purchase of programmes and other software. 51.6% buy from retail outlets while only 21% buy from mail order. Of these 49%, 45.8% and 40.8% were influenced, respectively by Reviews, advertisements and friends when considering a purchase. Shop displays came a poor 20% so the conclusions one draws from this is that the sales industry is largely motivated by the exposure products receive in the press. A vote in favour of the software vendors is the 73.3% rating of satisfied customers.

Technical Competency

While 82.5% of home users interviewed write their own programmes only 77.5% consider they have mastered their particular machine. The statistical evidence (see tables) show 77.5% have and 22.5% haven't quite mastered their machines, of these the 77.5% mastered their equipment within three months, 10.8% in six months, 7.5% took a year and then 4.2% have struggled gamely on for three years. This last statistic is mind blowing to some degree, have they been buying machine after machine as new ones come on the market or are they trying to master outdated machinery and failing through non existent support?

Comment on the Industry

Of the people interviewed 37.7% of the 88.3% not presently employed in the computing industry would, given the opportunity, defect from the home market. These far sighted people recognise the coming industrial revolution and will no doubt succeed therein.

WHICH MACHINE DO YOU HAVE?

ZX 81	25.8%
SPECTRUM	22.5%
PET	3.3%
VIC-20	18.34%
CBM 64	7.5%
BBC/ACORN	18.34%
DRAGON	3.3%
ORIC	3.3%
LYNX	4.16%
APPLE	5.0%
SHARP	.83%
OTHERS	10.0%

AGE OF INTERVIEWEE?

1-10	10-20	20-30	30-40	40-50	50+
2.5%	20.8%	37.5%	21.7%	10%	7.5%

HOW LONG HAVE YOU HAD A COMPUTER?

Months	1-5	6-10	11-15	16-20	20+
	31.66%	30.8%	20.83%	2.5%	14.17%

WHAT DO YOU USE YOUR COMPUTER FOR?

GAMES	61.7%
EDUCATION	35.0%
BUSINESS	28.3%
SCIENTIFIC	13.33%
GRAPHICS	35.8%
MUSIC	16.6%

WILL YOU BE BUYING A NEW AND BETTER COMPUTER IN THE FUTURE?

YES 75.8% NO 24.2%

DID/ARE YOU LEARNING COMPUTING AT SCHOOL/ COLLEGE?

YES 38.3% NO 61.7%

IF SO ARE/WERE YOU HAPPY WITH THE STANDARD OF INSTRUCTION?

YES 58.7% NO 41.3%

DO ANY MEMBERS OF YOUR FAMILY & CLOSE FRIENDS USE YOUR COMPUTER?

YES 79.2% NO 20.87%

ARE YOU HAPPY WITH THE STANDARD OF MANUFACTURERS' SUPPORT LITERATURE?

YES 30.8% NO 69.2%

DO YOU USE PROGRAMMES FROM MAGAZINES?

YES 73.9% NO 26.1%

IF SO ARE YOU HAPPY WITH THEM?

YES 38.2% NO 61.8%

WHAT DO YOU WANT TO READ IN MAGAZINES?

REVIEWS	80.8%
NEW PRODUCT REPORTS	61%
APPLICATION STORIES	28%
GAMES PROGRAMMES	49%
APPLICATION PROGRAMMES	38.3%
UTILITY PROGRAMMES	31.7%
BUSINESS	30.9%
PROGRAMMING TIPS	69%
INTERFACING	33%
PERSONALITY INTERVIEWS	18.4%
ADVERTISEMENTS	75.2%
EDUCATION	49.2%

DO YOU BUY PROGRAMMES THROUGH MAIL ORDER?

YES 21% NO 79%

DO YOU BUY PROGRAMMES FROM RETAIL SHOPS?

WHAT INFLUENCES YOUR DECISION TO BUY A COMPUTER?

REVIEWS	49%
ADVERTISEMENTS	45.8%
SHOP DISPLAYS	20%
FRIENDS	40.8%

ARE YOU SATISFIED WITH THE SERVICE OFFERED BY SOFTWARE VENDORS?

YES 73.3% NO 26.7%

DO YOU WRITE YOUR OWN COMPUTER PROGRAMMES?

YES 82.5% NO 17.5%

HAVE YOU MASTERED THE USE OF YOUR COMPUTER?

YES 77.5% NO 22.5%

IF SO HOW LONG HAS IT TAKEN YOU?

3 months	6 months	1 year	3+ years
77.5%	10.8%	7.5%	4.2%

ARE YOU EMPLOYED WITHIN THE COMPUTER INDUSTRY?

YES 11.7% NO 88.3%

IF NOT, WOULD YOU LIKE A POSITION IN COMPUTING?

YES 37.7% NO 62.3%

4th COMMODORE COMPUTER SHOW GUIDE

The fourth Commodore Computer Show is being held this year at the Cunard Hotel, Kensington, London, on the 8th, 9th and 10th of June.
Commodore Computing International will be there on stands A20 and B120. Our staff will be on hand to help you with any queries or advice.
Here is a selection of some of the more significant exhibitors and an indication to what they will be exhibiting.

ANAGRAM SYSTEMS – Stand B42/C41/B40: – will have its integrated accounting system on display during the show. The *Commodore Accounting Suite* includes purchase ledger with nominal headings, sales ledger with invoice printing and stock control. All of these packages operate on the Commodore 8000 series, but Anagram have also made available all of its ledger packages for use on the Commodore 64. This includes the stock control facility.

ANIROG – Stand B136: – will be exhibiting their normal range of software plus two new games for the expanded VIC-20 – *Galactica* and *Time Trek.* Also on display will be *Frog Run,* which is a new game for Commodore 64.

AUDIOGENIC LIMITED – Stand B101/B102: – are to launch 'Magpie' – a new data handling software package, at The Commodore Computer Show. Magpie features modeless operation for Commodore machines and is akin to new generation database systems such as Lisar Xerox. In addition, Audiogenic will be demonstrating over 120 VIC-20 and Commodore 64 software packages.

CDS LIMITED – Stand B152: – are to exhibit a new range of microcomputer furniture for the first time at The Commodore Computer Show. The Executive Suite is a collection of top quality desk furniture designed specifically to house micro-computers and their peripherals. While 'MicroTidy' is a compact unit for home computers such as the VIC-20 which folds away into a smart piece of furniture when not in use.

DATAVIEW LIMITED
will show their wide range of software plus the latest version of *Wordcraft* for the 8096. Also on the Dataview stand will be a demonstration of *Wordcraft* for the 700 and 64 and *Electronic Cashbook.* A new and improved version of Datalex will be available as well as DTL Compiler. Dataview are coming to this year's show as the 1982 winners of the ICP award for sales of *Wordcraft.*

INDEPENDENT COMMODORE PRODUCTS USERS GROUP – Stand B144/B141: – representatives from this nationwide grouping of over 40 dedicated user groups will be staffing several exhibits at the Show – displaying a wide range of 'public domain' software for the PET, VIC-20 and Commodore 64 (all of which is available to members through the ICPUG library). ICPUG members are also on hand to answer technical queries.

On Friday and Saturday afternoons (3.30 pm), in the seminar room, all visitors are invited to attend the 'Commodore Clinic' which is a forum with a panel of experts happy to answer your questions. Entrance is free.

INTERNATIONAL DATA AUTOMATION LIMITED – Stand B23: – will be at this year's Show with their range of work stations for the Commodore range of computers. IDA will also have available a brand new daisy wheel cleaning system and their popular range of preventative maintenance products including a disk drive head cleaning kit.

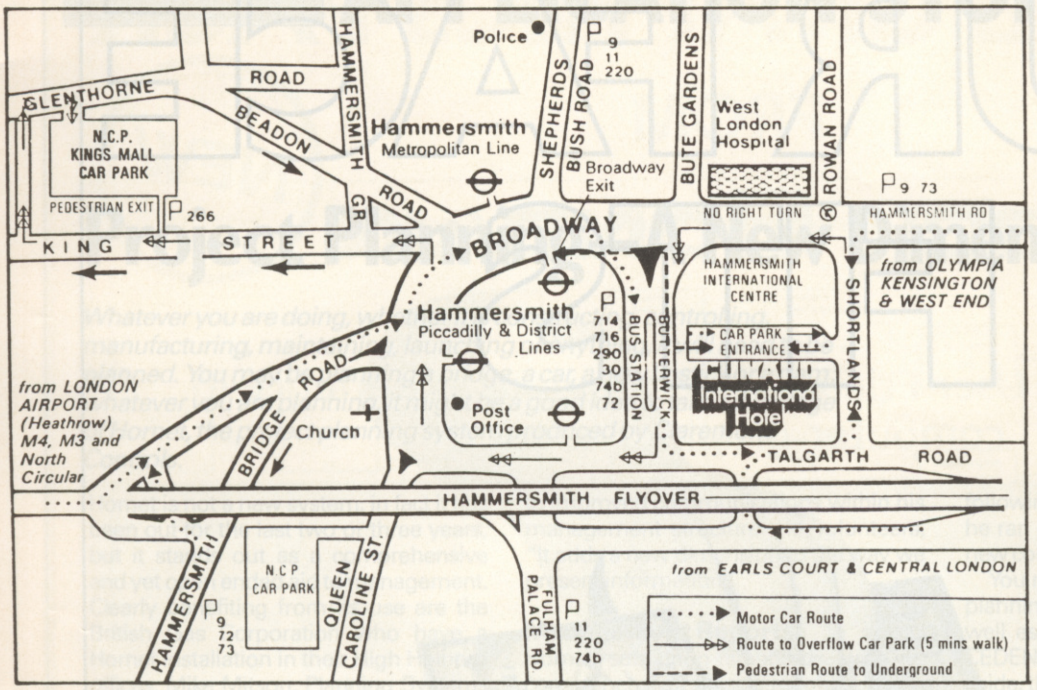
JCL SOFTWARE – Stand B27/A26: – will be showing their new MKIII EPROM Programmer which will program 64K and 128K EPROMS as well as the popular earlier types. One of these units is used by CBM at Slough for software development.

JCL will also show a new IEEE bus adaptor for the Commodore 64 and VIC-20, which allows the use of all normal PET peripherals – printers, disk drives, etc., but does not exclude use of the serial bus. An enhanced version of the popular Business ROM for the 700 series will be launched together with a new hotel guest accounting system.

JENTECH SERVICES LIMITED – Stand B76: – will be demonstrating a new option to their existing Digitmaster package. The new option is a colour graphics screen on which drawings may be directly created and merged. With this new feature, Digitmaster will resemble a conventional 2 screen system with full prompting capability. This adds immediacy and flexibility in altering and deletion to the extreme accuracy of the existing plotter based system.

KOBRA MICRO MARKETING – Stands C56/B57/C58/C59: – is one of the UK's leading distributors of business and systems software for the Commodore 8000 and 64 computers. Well known brand name products on show on the Kobra stand are 'Calcresult' – the only 3-D spreadsheet for Commodore computers; 'Paperclip' – the powerful but low cost word processor; 'Mupet I and II' – the leading multi-user systems for Commodore machines; Power and Pal professional programming aids; and VIC and 64 switch for low cost multi-user systems. Other products include 'Forth,' 'Stat,' and 'Diary' for the Commodore 64.

McDOWELL KNAGGS AND ASSOCIATES LIMITED – Stands B72/73: – will be demonstrating 'Finplan' a financial planning modelling package which simulates financial strategies. The new up-dated version of 'Finplan' on show incorporates graphics


Police
P 9 11 220
GLENTHORNE ROAD
BEADON ROAD
HAMMERSMITH GR
Hammersmith
Metropolitan Line
SHEPHERDS BUSH ROAD
Broadway Exit
BUTE GARDENS
West London Hospital
ROWAN ROAD
N.C.P. KINGS MALL CAR PARK
PEDESTRIAN EXIT
P 266
P 9 73
NO RIGHT TURN
HAMMERSMITH RD
KING STREET
BROADWAY
HAMMERSMITH INTERNATIONAL CENTRE
from OLYMPIA KENSINGTON & WEST END
Hammersmith
Piccadilly & District Lines
P 714 716 290 30 74b 72
BUS STATION
BUTTERWICK
SHORTLANDS
CAR PARK ENTRANCE
CUNARD International Hotel
from LONDON AIRPORT (Heathrow) M4, M3 and North Circular
BRIDGE ROAD
Church
Post Office
TALGARTH ROAD
HAMMERSMITH FLYOVER
HAMMERSMITH
N.C.P CAR PARK
QUEEN CAROLINE ST.
P 9 72 73
FULHAM PALACE RD
P 11 220 74b
from EARLS COURT & CENTRAL LONDON
Motor Car Route
Route to Overflow Car Park (5 mins walk)
Pedestrian Route to Underground

BY PUBLIC TRANSPORT

Underground trains run to Hammersmith from Central London on the Metropolitan, Piccadilly and District Lines Direct underground link with Heathrow for airline passengers on the Piccadilly Line which runs to Hammersmith Underground station. On leaving the station follow the dashed arrows as indicated on the map

BY MOTOR CAR

From Central London or Heathrow, follow the dotted arrows as indicated on the map and the local road signs to Hammersmith International Centre.

facilities which convert results into pictorial representation.

MILLS ASSOCIATES LIMITED – are the only approved independent maintenance and repair company for Commodore business computers. Being demonstrated for the first time at The Commodore Computer Show are the company's field and workshop services on the 9060 and 9090 hard disk drive units.

MMS SOFTWARE LIMITED – Stands B46/47: – are exhibiting 'Microfacts,' a totally integrated accounting package designed to process open item sales and purchase ledger, nominal ledger, stock, invoicing and costing. New versions of 'Microfacts' for the Commodore 8096 and Commodore 700 series will be launched at the Show.

PRECISION SOFTWARE LIMITED – Stand C35/B36/C38/B37: – will be participating in this year's show with one area of their stand dedicated to their wide range of software for use of the Commodore 700. Precision Software will be showing *Superscript II* on the 700 and will launch a new package called Super Base. In another area, all software for the Commodore 64 will be on display including *Super Office* – an integrated office administrator. Precision Software will also launch *Super Base* on the Commodore 64 which has the added advantage of linking in to *Easy Script* and *Easy Spell.*

SUPER CLERK LIMITED who have been associated with JCL Software under the Reprodesign banner will be launching a new accounting, word processing, payroll and filing system aimed at satisfying the needs of small business concerns. The package has been written using JCL business BASIC and includes the unusual feature that selected dealers will be encouraged to modify the program for special applications using notes and listings supplied by Super Clerk.

SUPERSOFT – Stand B114: – will be exhibiting an extensive range of software for all Commodore computers, with particular emphasis on the Commodore 64. MICRO Assembler, Busicalc Spreadsheet and Busiwriter Word Processor are just some of the new products being demonstrated, together with programming aids, utilities and games for the Commodore 64.

TECHNICAL SOFTWARE LIMITED – Stand A24: – will be demonstrating their *Plan Kit* program for project analysis. Also on show will be their suite of building services programs covering heat gain, heat loss, pipe and duct network and electrical lighting. A wide variety of technical programs will be available for demonstration.

THE COMPUTER ROOM – Stand B39: – are to exhibit their two Commodore Approved Products; 'Epic,' a production control system designed to run on the Commodore 8000 series machines, is used by many multimillion pound companies; and 'Moonship Supernews' is a low cost delivery and accounting package for newsagents.

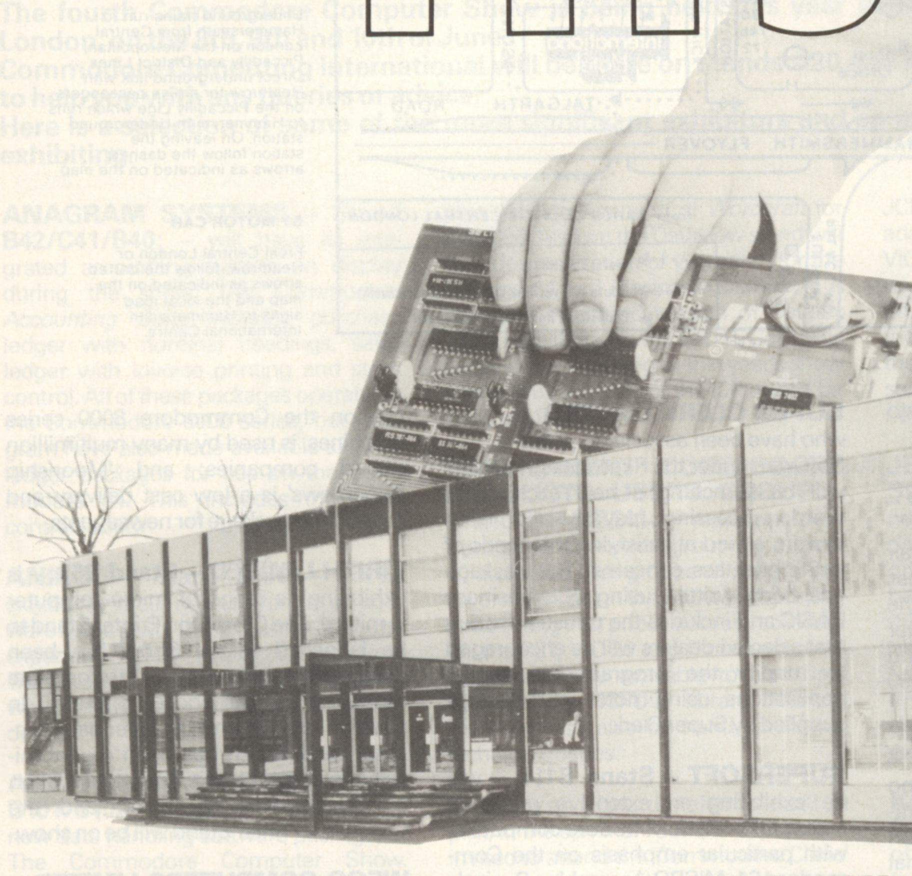
TIRITH LIMITED – Stand B63: – is exhibiting its range of micro-computer furniture. The Crompton Printer Stand to be launched at the Show has been designed to accommodate the complete range of Commodore printers. In addition, the Crompton Personal Computer Desk which has been ergonomically designed to take any combination of Commodore hardware; and the Crompton Printer Stand will be on show.

WEGO COMPUTERS LIMITED – Stand B66/B67: – this year will feature their ancillary range of Commodore approved products. These include products such as *Card Reader, Secret Switch Box,* and *Backpack.* A second stand will display *Word Pro* II, III, and IV, plus a new *Word Pro* package for the Commodore 64.

CUNARD
International Hotel

1 Shortlands, London W6 8DR
Tel: 01-741 1555. Tele 934539

OUR FACE FITS



We mean 'INTERFACE 80', of course. The system that provides fitting answers to your engineering problems. The cost-effective, simple method of controlling and increasing production efficiency.

'INTERFACE 80' is the D.I.Y. system for use with systems having an IEEE-488 port. Having standardised on the parameters applicable to the interchange of data and the hand-shake signal, we guarantee you a working system without extensive development.

Face Facts

Using our Decoder Card, the IEEE-488 Bus provides many facilities: Full Primary Address decoding, user selected on-board in the range 0–31; two 8 BIT wide Bus structures, a 'LISTEN' Bus and a 'TALK' Bus; and the IEEE-4888 handshake signals.

Give your business a face-lift

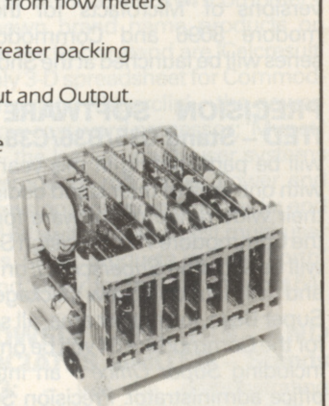
We've got a card that's right for you. Cards for 'INTERFACE 80' include: 12 BIT A/D with software control of input range, uni and bipolar 12 BIT D/A unipolar, bipolar current outputs – designed for control systems where the applications need a precision, software controlled, voltage output. 8 Digital Input/8 Digital Output. Provides an interface between mechanical and solid state switches, contractors, push buttons, etc., in plant monitoring simulations. Quad 8 BIT Totaliser/Counter. Can be used to accumulate pulse outputs from flow meters or similar devices.

Quad 8 BIT D/A Convertor; for greater packing density on large control systems.

6 Decade BCD/24 BIT Binary Input and Output.

32 Channel Multiplexor.

Machsize also design and make dedicated interfaces for many laboratory instruments; Rack Mounting industrial PET units; Process control systems; PROM-based PET utilities.



Contact us for full details of

'INTERFACE 80'

MACHSIZE LIMITED

Answers Engineering Problems.

Collins Road
Heathcote Ind. Estate
Warwick
(0926) 32141
Telex 312376

OFFICIALLY APPROVED BY COMMODORE

Project Planning—A New Dimension

Whatever you are doing, whether it is constructing, controlling, manufacturing, maintaining, launching or anything, it will need to be planned. You may be planning a bridge, a car, a new lipstick or a dam: whatever you are planning, it might be a good idea to take advantage of Hornet, the project planning system produced by Claremont Controls.

Hornet is not a new system, in fact it has been out for the last two or three years, but it stands out as a comprehensive and yet open ended aid to management. Clearly benefiting from its use are the British Gas Corporation who have a Hornet installation in their High Holborn offices. Mike Mitson, Planning Systems Engineer at British Gas, uses Hornet to monitor the construction of buildings and production plant. Although this may seem a specialist application of Hornet, the system is equally suited to projects in all areas of commercial activity. Mike Mitson points out that the main reason British Gas chose Hornet was its flexibility, but it was also important to them that the system they chose was easy to use. Hornet uses every opportunity to ensure foolproof operation.

Obviously what Mike Mitson was ultimately seeking was something which would help him, not only with the complex task of scheduling work and monitoring progress, but also as an aid to improved communications within his management structure. He volunteers, "It adds a new dimension to the way we present information."

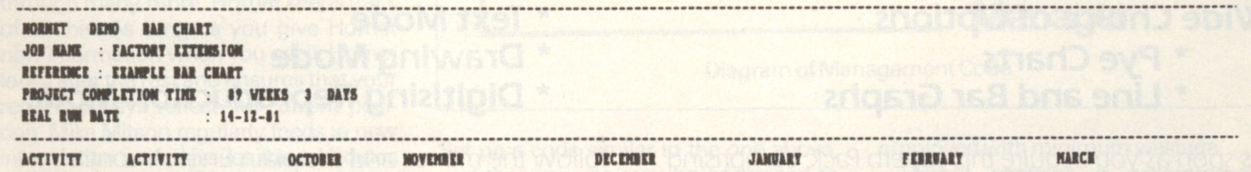
Management Reports.

Hornet sets high standards with its comprehensive repertoire of management reports: bar charts, histograms, schedules. These are all offered on paper or the screen and presented to a very high standard. British Gas acknowledge this fact and point to how they came to use colour reports. Hornet contains an advanced printer control option, which Claremont Controls claimed could easily be used to drive any printer capable of being connected to the computer. British Gas already had Digital III LA120 printers when they bought Hornet and these were quickly interfaced to the 8096 computers; when they obtained the DECOLOR option they decided to convert to colour. Mike Mitson recalls his surprise when after following the instructions in the manual he ran off a full colour bar chart on this new configuration at the first attempt.

You may be wondering how a project planning system works. Hornet uses a well established technique called PRECEDENCE DIAGRAM. Setting the jargon aside, this is a FLOW CHART you draw to show how all the activities in your project relate to each other.

If you take this one stage further and estimate how long each activity should take, it is possible to produce a schedule stating when each of the activities can start and finish. This is known in the profession as CRITICAL PATH ANALYSIS.

Activity scheduling is an important aspect of Mike Mitson's work. It is his job to ensure that all members of several project teams always know what they are supposed to be doing. Chaos would ensue if this were not properly co-ordinated. Mike Mitson started to use Hornet nearly a year ago and says, "The



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------------------------------------------------------------------------------------------------------------------------------
HORNET  DEMO  BAR CHART
JOB NAME  : FACTORY EXTENSION
REFERENCE : EXAMPLE BAR CHART
PROJECT COMPLETION TIME :  89 WEEKS  3  DAYS
REAL RUN DATE           : 14-12-81
------------------------------------------------------------------------------------------------------------------------------
ACTIVITY   ACTIVITY              OCTOBER        NOVEMBER                DECEMBER       JANUARY              FEBRUARY         MARCH
 NUMBER    DESCRIPTION           :12 :19 :26 :2  :9  :16 :23 :30 :7  :14 :21 :28 :4  :11 :18 :25 :1  :8  :15 :22 :1  :8  :15 :22 :29
------------------------------------------------------------------------------------------------------------------------------
  1000  PROJECT ALLOCATED   A000 AAAAA:   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :   :   :   :
  1010  FEASIBILITY         B100 :   AAAAAAAAAAAAAAAAAAAAA:   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :   :   :   :
  1020  PLANNING PROPOSAL   B100 :   AAAAAAAAAAAAAAAA   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :   :   :   :
  3000  DESIGN PERIOD       X00X :   WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE
  1030  OUTLINE PROPOSAL    B100 :   :   :   :   :   :   WWWWWWWWWWWWWWCCCCC///////////CCCCCCCCCCCCCCCCCCC   :   :   :   :   :   :   :
  1040  PLANNING APPROVAL   B000 :   :   :   :   :   :   WWWWWWWWWWWWWWSSSSS///////////------------------------------   :   :   :
  1050  SCHEME DESIGN       B200 :   :   :   :   :   :   :   *:  ///////////  :   :   :   :CCCCCCCCCCCCCCCCCCCCCCCCC   :   :   :
  1070  FINAL DESIGN        B200 :   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :CCCCCCCCCCCCCCCCCC
  1080  SUB-STRUCTURE       B2A0 :   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :SSSSSSSSSSSSSSSS---
  1090  SERVICES            B20C :   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :SSSSSSSSSSSSSSSSSSS
  1100  PROVISIONAL COSTS   B1AB :   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :SSSSSSSSSSSSSSSSSSS
  1110  PLANT/EQUIP LAYOUT  B2AC :   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :SSSSSSSSSSSSSSSSSSS
  1120  SPECIFICATION       B100 :   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :   :   :   :
  1130  WORKING DRAWINGS    B2AC :   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :   :   :   :
  1150  FINAL DRAWINGS      B2AC :   :   :   :   :   :   :   *:  ///////////  :   :   :   :   :   :   :   :   :   :   :   :
```

Diagram of Printed Bar Chart

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FROM
SUMLOCK BONDAIN

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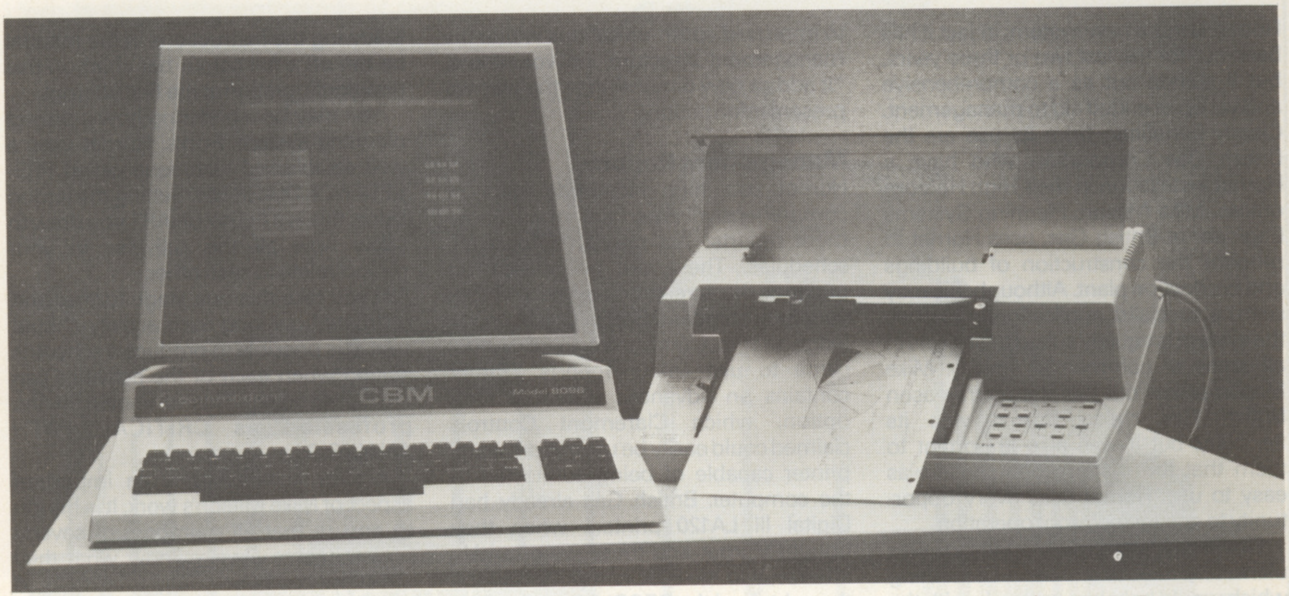
Extremely User-Friendly: no previous experience in computer-graphics needed



Designed exclusively for use with the (Commodore Business Machines) 8032 Computers and the Hewlett-Packard HP 7470 Graphics Plotter.

Wide Choice of Options

- **Pye Charts**
- **Line and Bar Graphs**
- **Text Mode**
- **Drawing Mode**
- **Digitising Reproduction Mode**

As soon as you acquire this superb Pack, comprising a 5.¼ inch floppy program disk and a special security dongle, you have a whole range of graph-creating facilities available via your CBM keyboard. Simply by keying in data, you can create pie charts, line graphs and bar charts (histograms). In addition, the Pack features programs for drawing polygons, rectangles, circles and ovals – plus virtually any other shape you wish, using the optional digitising pen.

Sumlock has made this software package extremely user-friendly and no previous experience with computer graphics is needed to obtain your first chart within 15 minutes after studying the easy-to-read, step-by-step instructions in the Manual. Just follow the menus and the plain English control procedures to select the options you want, then insert the data requested by each screen . . . . it's as simple as that!

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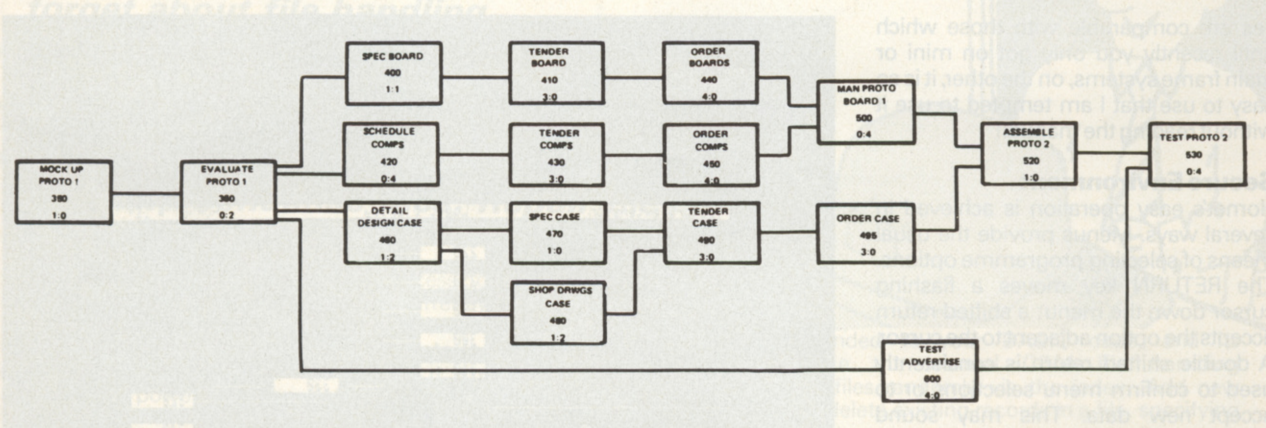
APPLICATION STORY

Diagram of Precedence Network


SPEC BOARD 400 1:1
TENDER BOARD 410 3:0
ORDER BOARDS 440 4:0
MAN PROTO BOARD 1 500 0:4
SCHEDULE COMPS 420 0:4
TENDER COMPS 430 3:0
ORDER COMPS 450 4:0
ASSEMBLE PROTO 2 520 1:0
TEST PROTO 2 530 0:4
MOCK UP PROTO 1 350 1:0
EVALUATE PROTO 1 380 0:2
DETAIL DESIGN CASE 460 1:2
SPEC CASE 470 1:0
TENDER CASE 490 3:0
ORDER CASE 495 3:0
SHOP DRWGS CASE 480 1:2
TEST ADVERTISE 600 1:0

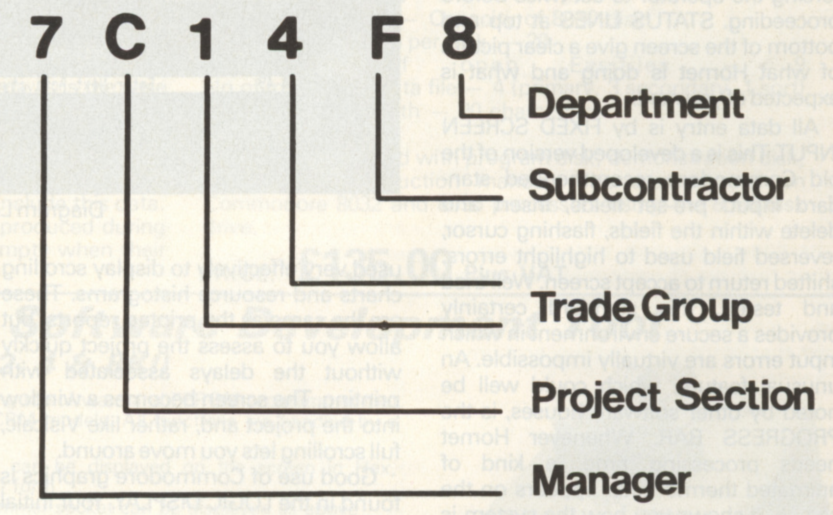

7 C 1 4 F 8
Department
Subcontractor
Trade Group
Project Section
Manager

Diagram of Management Code

desk top system gives every opportunity to try out our plans before putting them into action. This way, right from the start we are confident that co-ordination is feasible. Should something change, and it always does, we can absorb its effect smoothly using the excellent updating facilities offered by Hornet."

Keeping a project management system up to date is vital: once out of step, its information is worthless. When you realise that British Gas are scheduling perhaps seven or eight hundred activities at a time, you can imagine the potential for change. Since activities are inter-related, as shown on the precedence diagram, a change to one single activity may well cause a chain reaction through many more. Hornet keeps track of all this. As long as you give Hornet new information when you get it, Hornet looks after the rest and ensures that your reports always reflect the current position. Mike Mitson regularly feeds in new information and re-issues the schedules to key personnel.

Management Code

Mike Mitson is very enthusiastic about management reports: they are clear reports which enable him to maintain the communication necessary for good management. He has made very effective use of the MANAGEMENT CODE facility in Hornet. This is a neat solution to the problem of sorting out the complexity which arises when several hundred jobs are being done by a large organization. Hornet invites you to create your own coding system and relates different activities to the various people responsible for them.

Set up a code similar to the one above, and then reports may be addressed to precisely the people concerned: they will only receive reports which include information about the jobs for which they are responsible.

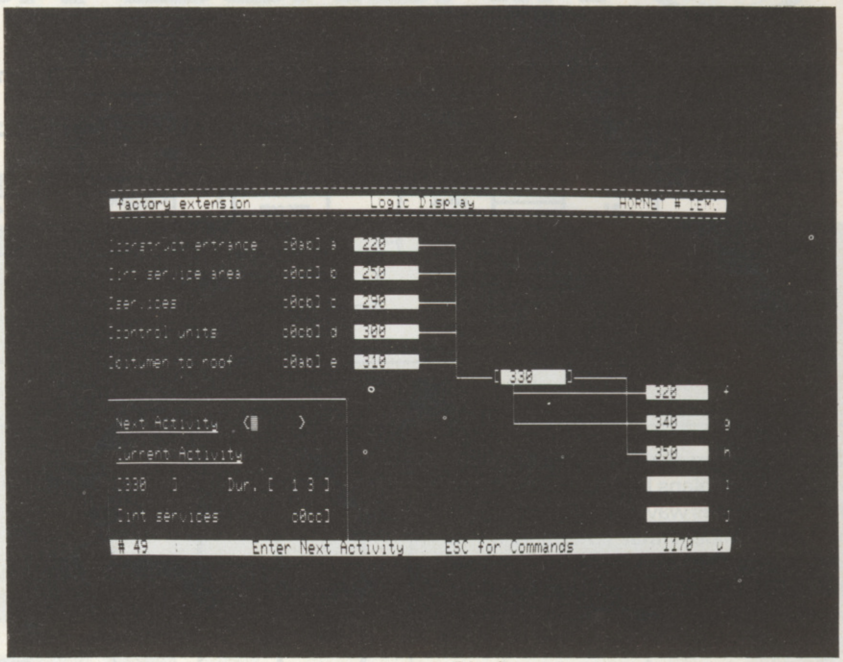
As well as scheduling his projects in Hornet, Mike Mitson also manages their resource requirements. Men, materials, money: Mike Mitson specifies precisely what resources he is using, and allocates them at a pre-determined rate to all the relevant activities in the project. Hornet then gives him histogram reports showing exactly what he needs and when he needs it. This projection allows him to plan ahead carefully and make sure that costly resources are fully employed with minimum wastage.

Hornet contains a programmable calculator which allows him to perform his own calculations using resource information. This is particularly useful to Mike Mitson: he is able to take a resource such as 'welders' and multiply it by the daily cost rate for welders; he adds the result to another resource called 'piping' which has been multiplied by its unit cost: the result is a new resource which is the 'cost of welded piping.'

Mike sees this kind of sophistication as typical of Hornet's approach. "Hornet is deceptively simple to use," says Mike with a hand resting on the 8096 keyboard, "on the one hand its capabili-

APPLICATION STORY

ties are comparable with those which until recently you only got on mini or main frame systems, on the other, it is so easy to use that I am tempted to use it without reading the manual!"



```
factory extension              Logic Display              HORNET # DEM.

[construct entrance   [0ab] a  220
[int service area     [0cc] b  250
[services             [0cb] c  290
[control units        [0cb] d  300
[bitumen to roof      [0ab] e  310
                                          [ 330  ]
                                                          320   f
Next Activity  (█      )                                  340   g
Current Activity                                          350   h
[330   ]       Dur. [  1 3 ]                                    i
[int services         [0cc]                                     j
# 49   :         Enter Next Activity    ESC for Commands        1170  υ
```

Diagram Logic Display.

Secure Environment

Hornet's easy operation is achieved in several ways. Menus provide the usual means of selecting programme options. The RETURN key moves a flashing cursor down the menu: a shifted return accepts the option adjacent to the cursor. A double shifted return is consistently used to confirm menu selections or to accept new data. This may sound unnecessary but it minimises errors, forcing the operator to act twice before proceeding. STATUS LINES at top and bottom of the screen give a clear picture of what Hornet is doing and what is expected of you next.

All data entry is by FIXED SCREEN INPUT. This is a developed version of the old Commodore recommended standard input: pre-set fields, insert and delete within the fields, flashing cursor, reversed field used to highlight errors, shifted return to accept screen. Well tried and tested, this standard certainly provides a secure environment in which input errors are virtually impossible. An unusual feature, which could well be noted by other software houses, is the PROGRESS BAR. Whenever Hornet needs processing time, a kind of animated thermometer appears on the screen. It shows you how the system is getting on. Although only displayed briefly throughout the programme, this does reduce the worry of staring at a blank screen and wondering whether the system has "hung." As you would expect with a system of this quality, Hornet is crash proof. Mike Mitson recalls one occasion when a power failure occurred in the middle of an update to one of his projects. Thinking that he would have lost his data, he re-loaded the system and was amazed to see a message appear (complete with progress bar) stating "recreating index." Hornet sensed the illegal termination, remembered it, and when re-started spent the first five minutes validating its own data base!

Easy operation is not only confined to finding your way around the programme and inputting data. The screen is used very effectively to display scrolling charts and resource histograms. These are the same as the printed reports, but allow you to assess the project quickly without the delays associated with printing. The screen becomes a window into the project and, rather like Visicalc, full scrolling lets you move around.

Good use of Commodore graphics is found in the LOGIC DISPLAY. Your initial precedence diagram is displayed rather like an electrical circuit: each activity becomes a component in the circuit, and 'wires' show how it is connected to the other components.

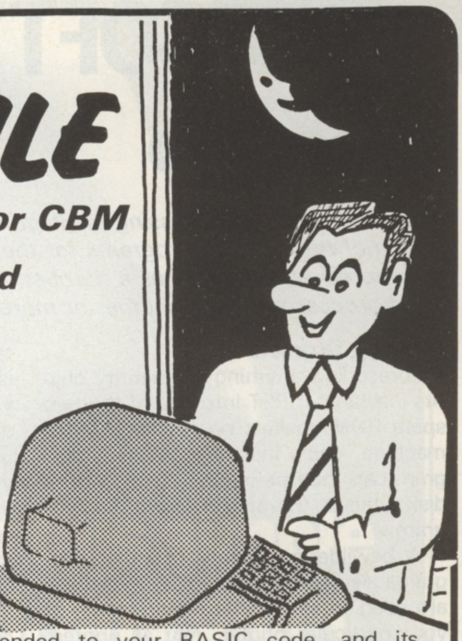
Transfer Information

You may think that this already sounds like an extremely powerful system, but Hornet still has another trick up its sleeve: it interfaces with Silicon Office. Hornet puts all your data on one disk, using the other disk for its own programmes. Select the SILICON OFFICE LINK option on the menu and you can replace the programme disk with a Silicon Office data disk. Hornet then allows you to transfer information freely, in either direction, directly between the two data disks. British Gas use this combination to take advantage of the Silicon Office wordprocessor, its calculator and data base facilities which it couples to the programme management facilities of Hornet. Mike Mitson acknowledges both Hornet and Silicon Office as powerful systems in their own right, but combined he sees the potential as almost limitless: in fact, he thinks it is so good that he has started a Hornet/Silicon Office User Group to encourage users to share their experience of the combined application.

Mike Mitson's enthusiasm for Hornet is undoubtedly apparent, but he is not alone in his committment to the system. Claremont Controls who produce Hornet, confirm that his enthusiasm is typical amongst users.

Hornet is a powerful application of Commodore Microcomputers. It sets the standards you should expect of a user-orientated package. It comes complete with a clear and intelligent manual. Do not be put off by the apparent complexity of the system, if you are involved in project management of any kind, Hornet should be able to help. Further details can be obtained from Claremont Controls Ltd, Albert House, Rothbury, Morpeth, Northumberland, NE65 7SR.

Get to bed early with EASIFILE



- **Multi-key Indexed Sequential File Handler for CBM**
- **Append EASIFILE to your own programs and forget about file handling**
- **Reduce system coding time by at least 60%**
- **Unlimited file sizes**
- **Standard Routines for: Menus; Reorganise, sort and condense files; Repair files after disk errors**

EASIFILE gives BASIC programmers access to advanced, high integrity file handling routines, as currently offered on large mainframe computers, using GOSUB calls. Multi key indexed sequential file structure stores data in contiguous sectors in designated areas in the order it is entered. An EPROM adds powerful screen, data entry and file commands to BASIC.

Menu driven routines allow data and index files to be created, defined and condensed. Sector patch routines display data and permit modifications to be entered in ASCII or Hex — Ideal for correcting errors discovered after transaction update runs. Corrupt sectors can be rebuilt and written back, without loss of subsequent data as is the case with chained file architectures.

Failure to close an EASIFILE, as a result of premature end to user program, is detected by the system which prevents previously entered data being overwritten. In this event, a utility allows the index files to be rebuilt to include this data. A listing of the key field of each record is produced during restoration. Existing files can be reset to empty when their contents are no longer needed.

EASIFILE is appended to your BASIC code, and its commands replace the normal CBM file handling instructions. Read files randomly via the index. Add new records, update or delete existing records in a file, specifying only a key value.

SPECIFICATION

Maxmum File Size — Capacity of 8050 disk
Max No of Easifiles per disk — 20
Max No of open Easifiles — 9
No of index files/data file — 4 (primary, 3 secondary, 1 sort)
Max index key length — 20 characters

EASIFILE is supplied with program disk, demonstration disk, EPROM and instruction manual. The system runs on Commodore 8032 and 8096 processors using the 8050 disk drive.

PRICE: £135.00 Plus VAT

The Ultimate CBM Software Development Tool

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A comprehensive and powerful system comprising of software and EPROM programmer that connects to the user and cassette ports on all CBM models. All functions are handled by a single screen display and include:

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PUT	Writes display data to disk in loadable program format
LIST	Allows displayed data to be listed on printer
CHANGE	Displays can be scrolled and modified directly
WRITE	Writes contents of display to EPROM in programmer socket

Caution
Davidson-Richards Ltd
UNIVERSAL
EPROM PROGRAMMER
WIDELY ACCLAIMED SOFTWARE

Other facilities allow the movement of data into different work areas to provide, for instance, the facility to write the data from two 4K EPROM's into an 8K, verification of written EPROM's and changing type of display. Supports all single rail EPROM's — 2516, 2716, 2532, 2732, 2564, 2764 and equivalents.

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CBM Model .... SK Yes/No Disk Drive ....
Cheque Value (Please include 15% VAT) .... enclosed.
Name ....
Address ....
....
.... Tel (Day) ....

SOFTWARE REVIEW

PaperClip

Not another word processing package ? Oh yes, but this month we look at one of the cheaper programs for the Commodore range of micros, and moreover one that has a number of features that users of other word processors will welcome, or more likely envy!

Getting Started

Before doing anything, a security chip fits inside your PET into one of the two spare ROM sockets on the 8000 series machine. Once installed, the first program can then be loaded and run from disk : this is the master PaperClip program.

A bewildering variety of other programs also exist on the disk, and these are used to satisfy the requirements of your particular printer. Not all printers are the same, and many similar packages take up valuable memory space by trying to accomodate each one of them from within the main program. PaperClip defaults to communicating in PET ASCII, but you can easily alter this to suit your own printer.

That is all you need to do before beginning to use your Commodore PET as a word processor.

Those of you who are already familiar with the screen editing facilities of the PET will be pleased to know that PaperClip follows much the same rules. Inserting or deleting text, altering existing text, are all performed in the usual way, by use of Commodore's unique editing system. Move the cursor to the text that requires changing, and simply change it!

Ranges of text, be they complete screen lines, phrases within a paragraph, or columns of text (or figures) can also be accomodated, and moved or replicated to wherever you would like them to be.

Formatting your text for later output is NOT done as you type it in. Instead you have a large number of embedded control commands that be inserted wherever you like in your main text area, and these only come into effect either when printing out the finished result, or looking at it on the screen in video output mode. Thus you have to remember that you do not get what you see on the screen.

All the major features which you would like to see in a dedicated word processor are available in the formatting commands, such as altering margins, embedded margins, superscripts and subscripts (if your printer allows it), underlining, conditional hyphens, and so on.

Drawbacks

Formatting text in this way has advantages and disadvantages. An advantage is that you are not continually seeing your text jump around the screen as it desperately tries to fit everything into place. This is especially true when you're using one of PaperClips more advanced features, that of horizontal scrolling. In other words, you aren't confined to typing your text into a 40 column screen width.

On the other hand, embedding your commands into the text area does take up vital memory space. PaperClip does not allow the largest amount of memory to be stored anyway, and taking up 80 bytes just to skip a line seems a needless waste of space. Multiple commands can be stored on a single line, but you will probably use up at least one kilobyte of memory in a single file just by specifying a gap of one line every now and again.

Annoying

PaperClip is a package that, after a few days of usage, proves to be extremely annoying. It can do so many things that are not within the grasp of other, more expensive, packages, but at the same time falls short in other areas.

You can, for instance, sort fields of text into ascending or descending alphabetical order, with up to 16 levels of subfields, but you can't sort numerical data. You can perform simple numerical addition and subtraction, and print the results as part of your text file, but you can't spool files from disk. Thus your machine is tied up whilst printing out.

As a consequence you find yourself liking the good aspects, and hating it for its shortcomings. It is nice to be able to perform multiple mailouts, and have files globally linked together for outputting documents longer than one file area, to have a word count for articles output to the screen, and produce a table of contents, but why can't you .... ?!

Conclusion

PaperClip goes further than most word processing programs for home computers, and has many powerful functions not found on other, much more expensive programs. You will certainly find it easy to use, and your secretary shouldn't take too long in adapting to it. It will certainly replace his/her typewriter within a very short space of time.

But there is so much that it doesn't do. We've outlined the shortcomings earlier, so there's no need to go through them again, but when you see other programs than can do background spooling, that don't waste vast amounts of space when formatting text, or whatever, you do wonder why they didn't get it right with this! Oh well, we're left with the old adage of 'you pay your money, you take your choice'. But that choice is getting wider every day!

Product:	*PaperClip*
Area:	*Word Processing.*
Price:	*£149.00 for 8000 series,* *£129.00 for 4000.*
Configuration:	*PET, disk drive, printer.*
Company:	*Kobra Micro Marketing.*
Address:	*PO Box 28, Henley-on-Thames.*
Tel:	*04912 2512.*

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MASTER has 17 DISK HANDLING commands (both keyed and sequential access, masked retrieval, batch operation, existence tests, etc)... 12 INPUT MANAGEMENT commands (input/output screen zones, with alpha, numeric and date formatting, etc)... 8 SCREEN MANAGEMENT commands (with screen pages loadable from disk or memory)... 10 commands for REPORT MANAGEMENT (with disk-loadable report formats)... 18 BUSINESS BASIC commands (with 20-place arithmetic, data compression, automatic date control etc)... and on the CBM 8096, all the features of PM96 (46K for programs, 26K for variables, as well as 17 BASIC UTILITY commands).

MASTER supports the CBM 8032/8096, 8032+CP/MAKER, and 4040/8050/8250 floppy disks, plus CBM 9060/9090 hard disks, and is supplied with a User Reference Manual, Quick Reference Guide, Demo Disk, and with a key for either cassette port. Supplementary RUN-TIME keys are available for multiple users and software houses.

PM 96

At last you can program the full capacity of the CBM 8096, with 53K for programs (up to 15 simultaneously) and 26K for variables (maintained even while editing or loading)... and use 17 new Basic commands as well, including all the TOOLKIT commands, plus PRINT USING, IF-THEN-ELSE, STOP KEY disable, HARDCOPY screen dump, CALL, FETCH, PLOT (50 by 150), WINDOW, and more. PM96 comes with a User Reference Manual, Quick Reference Guide, Disk with demo programs, and UD11 Support Rom.

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is the ultimate CBM wordprocessor! Wordpro-compatible (except for price)... with up to 20,000 characters of text, and 240 characters screen format... and no Roms or dongles to instal! SuperScript has been adopted by Commodore for their new models... and is now joined by SUPERSPELL, a 30,000 word disk dictionary, which easily verifies the largest Superscript (or Wordpro) document in 80 seconds... and user-defined words can be added. SUPERSCRIPT and SUPERSPELL suit most CBMs, disks and printers, and letter-quality printers.

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COMMAND-O (for Basic IV, state which Pet)	*£59.95*
DISK-O-PRO (Adds Basic IV etc to Basic II)	*£59.95*
SPACEMAKER 4-Rom adaptor (not for 8096)	*£29.95*
VISICALC 32K/96K RRP £180.00, less £35.00	*£145.00*

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SOFTWARE REVIEW

CP/M for CBM?

Most Commodore users have been brought up in an environment of software products which are firmly based on the principle of extracting the maximum performance from the 6502 chip set. Intel 8080 and Zilog Z-80 have been largely ignored, while CP/M and its potential are virtually unknown.

A few inquisitive souls have ventured into this strange new territory by acquiring Z-80 alternative processors, either the CP/Maker from Tamsys or the Stuntbox from Small Systems Engineering.

Now, however, with the advent of new products from Commodore, all that is going to change. CP/M in one or other of its forms will be a standard option on all new products. This article is intended as an introductory guide to some of the variations of CP/M and what the user can expect from them.

Brainchild

CP/M stands for Control Program for Microprocesors. It is the brainchild of Californian Gary Kildall and is now the baseline product of his company Digital Research, which has also developed a range of other products.

CP/M is a basic operating system providing a standard set of facilities on Intel 8080/8085 and Zilog Z-80 chips. It consists of a number of integrated modules of which the most noticeable are the basic disc operating system (BDOS), the console command processor (CCP), and the basic input/output system (BIOS).

The latter is the part of CP/M which is most obvious as it is customised and adapted to each manufacturer's hardware. CP/M has had a reasonably stable existence and has experienced only one major change when it was upgraded (about 18 months ago) to version 2.2, which is the current version.

Digital Research are aware of and responsive to user criticisms and have recently announced an enhanced but totally compatible version known as CP/M Plus (often referred to as CP/M 3) which has improved disk I/0 handling, error trapping and help features and provides bank-switching facilities which enable it to function with memory larger than 64K. CP/M Plus is offered as an alternative operating system for those manufacturers who choose to implement it.

Several Users

The next product in the family is MP/M, the multi-processing version of CP/M. Designed for machines which offer larger memory capacities, it employs bank-switching techniques to enable several users to work on the system via their own separate VDUs. It provides record contention and locking facilities to cope with this tricky area of multi-user systems.

MP/M had an erratic start, but the current version, 2.1, is a stable and useful product. CP/Net is a product often used withMP/M as it enables multiple single users to work with MP/M on a network basis.

So much for the 8-bit products; now what of the 16-bit offerings? Whereas in the 8-bit market Digital Research have had things very much their own way, there are competing products in the 16-bit market. Microsoft offer the single user MS-DOS, adopted by IBM for the PC as PC-DOS, and Xenix, a multi-user extension with features not unlike Unix, which in turn is proving popular on the 68000 based machines.

Digital Research have a range of com-

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16K to 32K—£30 8K to 32K—£55
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CP/M for CBM?

peting products. CP/M-86 is functionally similar to the 8-bit CP/M 2.2, while MP/M-86 is for the multi-user market. The 68000 is catered for by CP/M-68K, but the product that really catches the eye is the Concurrent CP/M. This is basically CP/M-86, but with enhancements derived from MP/M type technology, which enable a user to perform many tasks simultaneously in a single processor station.

This means that, for example, four tasks are executed at the same time in their own segments of memory; each task uses a virtual console. The user can call up any of the virtual consoles onto physical console by control key.

Graphic Tools

What sort of applications can users expect? On the 8-bit front, both Microsoft and Digital Research offer a range of language compilers and interpreters under CP/M. On the 16-bit side, both companies' products only work with their own operating systems. Both manufacturers are also extending their products with Digital Research producing a range of powerful graphics tools while Microsoft are building their Mult tools family of standard applications.

Among other language tools on the market, the UK specialists Micro Focus have a collection of COBOL products available in both 8-bit and 16-bit. There are several good word processors with comprehensive mailing and spelling features, of which the Wordstar family is probably the best known. PET users weaned on a diet of Visicalc will find a plethora of spread-sheet programs and modelling packages.

One of the most recent arrivals in this area is Scratchpad, with an interesting feature: when it fills up the available core with part of a spreadsheet it writes away to disk and carries on regardless.

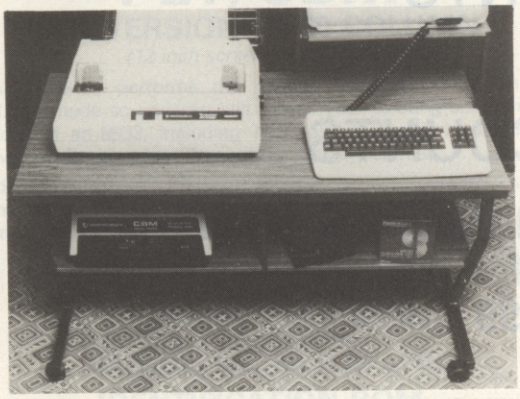
There are in fact several thousand packages written and implemented under CP/M. Among these are database management products ranging from the super-powerful MDBS III to the surprisingly cheap but clever Cardbox. dBASE II is a typical mid-range product which will surprise those Commodore users who have worked with Silicon Office.

For Commodore users the important question is which of the various systems options will be offered on the new machines?

More information from Tamsys Ltd, Pilgrim House, 2-6 William Street, Windsor SL4 1BA (tel 95-56747).

Patricia Oldcorn

Patricia Oldcorn has pursued a successful career in business management. She is currently Marketing Director for Tamsys Ltd.



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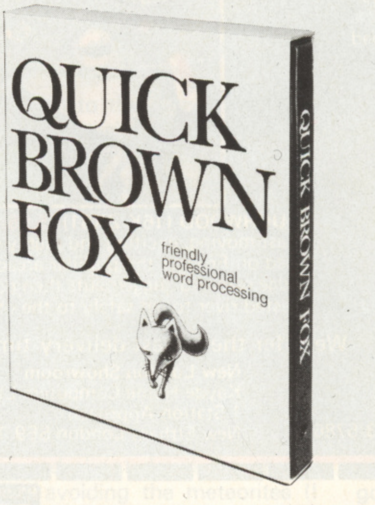
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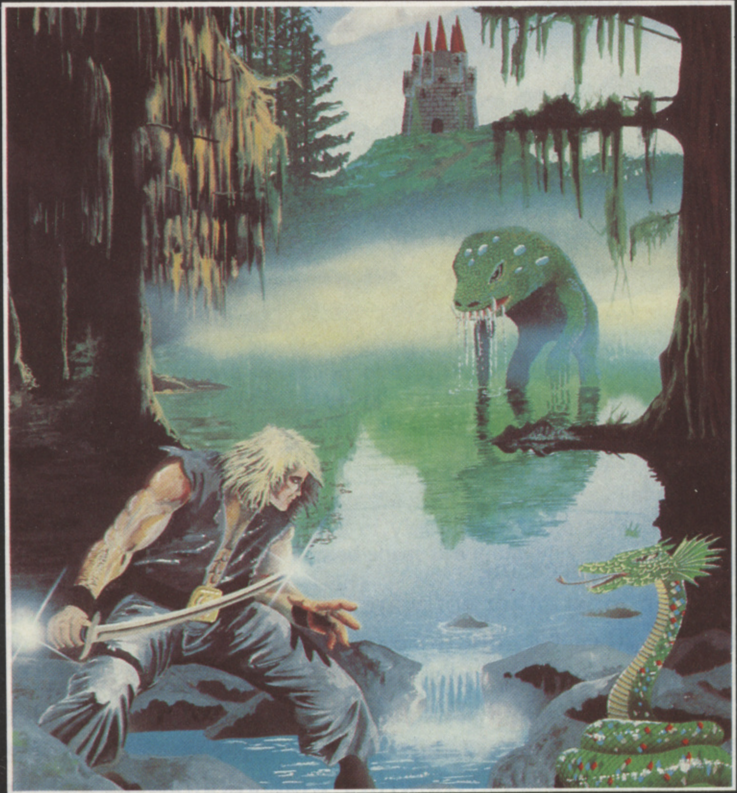

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GAMES REVIEW

Be a Gopher and Save the Supersoft Kactus

Three games to look at this month: two for the 64, one called Kactus marketed by Supersoft and one called Rox 64 from Llamasoft, and a game for the Vic from Lyversoft called Space Assault for the VIC with 3K or 8K expansion.

First then, Kactus for the 64. The program comes on cassette and is in a fairly plain box. Could be an improvement on the flashy cassette covers for games with not much inside. The idea of the game is to protect a Cactus from being eaten away at its base by a multitude of hornets and wasps.

The player is a Gopher situated under ground with two holes (at the start of the game). The Gopher can only fire at the hornets through the holes although if daring or foolish enough you can come up out of the hole and fire at the hornets and wasps. There are however a few more hazards to be overcome; the hornets have to be shot twice to be wiped out!! and there are buzzards that fly over occasionally and drop egg bombs at the Gopher.
As well as this the hornets and wasps leave behind them acid droplets that gradually sift down and through the earth; if they touch the gopher it dies. All the time you are zapping at and avoiding the hovering creatures they are slowly nibbling at the base of the cactus. The game is lost if they succeed in toppling the cactus.

There is also one last hazard to watch out for; a mole appears frequently and zooms across the screen; if it succeeds in getting to the nearest hole it will block the hole. The mole will blindly obliterate you if you get in its way as well. You can however thwart the mole by killing it; your reward will be anything from 100-250 points.

The points for the destruction of the other fellow beings are:-

Buzzard - 500 points.
Buzzard's egg - 500 points.
Hornet - 10 - 350 points.

The control keys are :-
W=UP. A=LEFT. D=RIGHT.
X=DOWN. L=FIRE.
or you can use the joystick.

Out of the three games reviewed here Kactus is by far the best, in fact, the other two games are not even in the same class, given the restriction of the VIC compared to the 64.

The graphics are very good; no spare bits of garbage appear, while the sprites are used for both the mole and the gopher and have been excellently programmed. The only disappointment was the fire button on the joystick, occasionally a little slow. The game is original, fast, addictive and generally fun to play. The sounds are well suited to the game. So all in all a well calculated and well programmed game for the 64.

Kactus is priced at £7.95 and is among the lower priced, high quality software. I think that a good mark of any software is that it should actually do what it is set up to do and in a way that is pleasing and comprehensible. Kactus certainly does just that.

The second of our three games is called Space Assault. From Lyversoft it is for the VIC and requires either 3k or 8k expansion.

I tried to load the game with 8k expansion in and was told that as I had more than 3k in place the VIC would rearrange the memory and that I should re-load the program. This was a bad start and I feel that the program should have handled this without any effort on my part, as it boasts 3k or 8k expansion.

Anyhow, on to the game, after this problem on expansion and waiting for the program to load as it is in two parts, I eventually got the game started. Having been told in the first program that the control keys were Q=up, A=down and 'f7'=Fire, along with a badly presented explanation of the game, I was ready to start, so I did. My first thought was another version of Scramble until I realised that it was not good enough to merit that description.

The object of the game, if you can call it that, is to guide your ship over the landscape and shoot down the enemy ships while avoiding the meteorites (I think that's what they are). You can also shoot at objects on the ground, some of which are fuel dumps. If you hit these or if you manage to dock with the refuelling ship you are refuelled! The game is very slow, the player's ship operates too slowly to avoid the objects, causing the player to crash. The game is written entirely in Basic though this does not excuse its slowness and sloppiness. The graphics have been programmed correctly, but the screen gets so crowded that it is often difficult to see what is going on.

To conclude, I don't think this should have been released; it is to my mind not fully debugged and not very original. The sound and colour are fairly bland, the graphics work but are not special and to finish it off the program regularly stops. One hopes as a reviewer and as a punter that this is a faulty tape or a faulty version.

Priced at £5.95 it is not for my collection.

The final game for this month for the 64 is from Llamasoft and is called Rox 64. There are no instructions on the cassette, but there are adequate instructions within the game. The object of the game is to protect your moon base from falling meteorites. To do this the player uses the following keys:-

V to fire diagonally to the left.
B to fire up.
N to fire diagonally to the right.
SPACE to activate the panic button (this destroys the meteor, use only when you are in danger).

The game first displays the instructions and then you watch as your ship (a sprite), slowly descends. A nice touch and good usage of sprites. The game then commences and you must survive each attack. As well as the panic button you can also abort the game at any time by pressing 'A' . Although the game is not as fast as it could be it is a good game and demonstrates some of the abilities of the 64 very well.

For every attack you survive you gain bonus points and if you survive the whole game, even if you have aborted, there is a bonus. The game also keeps a high score table as on arcade games. I was told before seeing the game that it was not very good, but although it is not up to Llamasoft's usual standard it is still good value for £4.95.

I was impressed by the sound effects and by the fancy use of colour in the game. It is worth having for your 64 even though it lacks speed. I almost forgot to mention that its best facility is the use of sprites and as it is written in Basic it is easy for the novice to go through the listing to get the feel of using his 64.

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Roy's Combo Makes Music on the 64

This month we are going to take a look at a software package called SYNTHY-64 written by Roy Wainwright.

As the name suggests, the package is a music and sound synthesizer for the 64. It comes with a manual and some demonstration music.

The package enables the user to 'program' music into the 64 using special commands set up by synthy. The first line of the program must be 1 RUN which starts synthy. After that, all lines must contain only synthy commands. An example of the commands available is: +@WT which sets the waveform of voice 1 to Triangle. If the command @WT was preceded with a - sign, then it would be voice 2 and if the symbol was a £ sign, then it would be voice 3.

Tone generator commands are as follows:

@An,@Dn,@Sn,@Rn,@Fnn,@Fnnn,@Gnn,@Mnn,@Pn,@Qnnnn,@Ynn,@Wn$.

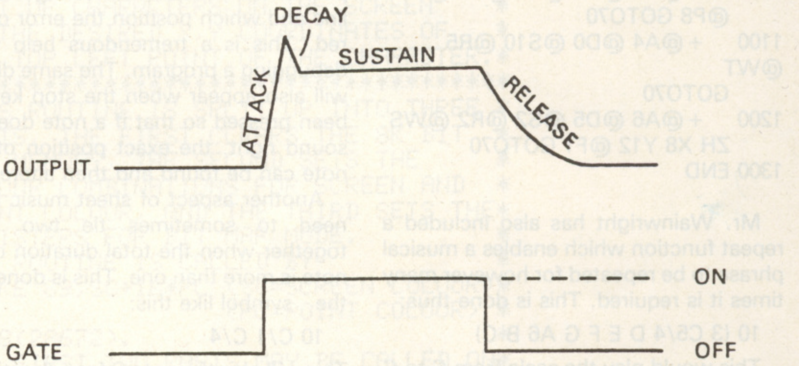
n is a value between 0 and 15.
nn is 0 or 1.
nnn is 0,1, or 2.
nnnn is a value between 0 and 65535.
Freq(Hz) = ((nnnn)*0.05965)Hz.
n$ is either N, P, S, or T for waveform.

@An - Sets the attack of the specified voice. Which is :The time it takes to get the output to maximum amplitude.
@Dn - Sets the decay. :The time it takes to drop to the sustain level.
@Sn - Sets the sustain level. :The level at which the note will remain until the release cycle is started.
@Rn - Sets the release. :The time it takes to drop from sustain to zero amplitude.

These four values set up the 'envelope' of the voice.

Value (dec)	Attack rate (ms)	Dec/Rel rate (ms)
0	2	6
1	8	24
2	16	48
3	24	72
4	38	114
5	56	168
6	68	204
7	80	240
8	100	300
9	250	750
10	500	1500
11	800	2400
12	1000	3000
13	3000	9000
14	5000	15000
15	8000	24000

The envelope comes into effect when the note is read from the program, the gate is turned on and the attack/decay/sustain cycle begins. When the duration is over, the gate is turned off and the release cycle starts. Therefore with a high release value, the note will be heard long after the duration is over provided that no note is played on that voice directly afterwards.



@Fnn - For voice 1 or 2, sets filter on or off.
@Fnnn - For voice 3, sets filter on or off or output off.
@Gnn - Turns the gate on.
@Mnn - Turns ring modulator on or off.
@Pn - Sets pulse waveform value.
@Qnnnn Sets a frequency in the voice instead of a note.
@Ynn - Turns sync on or off.
@Wn$ - Sets the waveform of the voice.

All of these commands may be preceded with the voice symbols + , -,£ to specify voice, except for the command @Fnn preceded by + , or - and @Fnnn preceded by £.

In addition to these commands, there are a few global sound commands. These are as follows:

Vn,Tnn,Xn,Yn,Zn$

Where n is a value between 0 and 15, nn between 15 and 255, and n$ either H, L, or B.

Vn - Sets the volume of the output.
Tnn - Sets the tempo, 15 slow, 255 fast.
Xn - Sets the filter frequency.
Yn - Sets the filter resonance.
Zn$ - Sets the filter bandwidth for high, low, or band pass.

These commands are NOT preceded with any voice symbol.

An improvement to the above program might be:

```
1  RUN
2  "(CLR)CHOOSE AN INSTRUMENT:"
10 "(2CD) 1 PIANO"
20 " 2 FLUTE"
30 " 3 ACCORDION"
40 " 4 END PROGRAM"
50 INPUT1000, 1100, 1200, 1300
60 GOTO2
70 V15 T100 C5/4 D E F G A6 B C
80 GOTO2
1000 +@A0 @D9 @S0 @R0 @WP
     @P8 GOTO70
1100 +@A4 @D0 @S10 @R5 @WT
     GOTO70
1200 +@A6 @D5 @S2 @R2 @WS
     ZH X8 Y12 @F1 GOTO70
1300 END
```

This would allow the user to choose an instrument and play a scale using that instrument.

To watch the scale being played, Mr. Wainwright has included a trace function which displays what is contained in all of the registers and the line and position that the program is being read from. To get the above program to trace, change line 80 to 80   GOTO2 (the sign turns off the trace function), and put into lines 1000,1100,1200 a '   ' after the line number to turn the trace on but remember the space.

The above program would then look like this:

```
1  RUN
2  ''(CLR)CHOOSE AN INSTRUMENT''
10 ''(2CD) 1 PIANO''
20 '' 2 FLUTE''
30 '' 3 ACCORDION''
40 '' 4 END PROGRAM''
50 INPUT1000, 1100, 1200, 1300
60 GOTO2
70 V15 T100 C5/4 D E F G A6 B C
80   GOTO2
1000    +@A0 @D9 @S0 @R0 @WP
     @P8 GOTO70
1100    +@A4 @D0 @S10 @R5
@WT
     GOTO70
1200    +@A6 @D5 @S2 @R2 @WS
     ZH X8 Y12 @F1 GOTO70
1300 END
```

Mr. Wainwright has also included a repeat function which enables a musical phrase to be repeated for however many times it is required. This is done thus:

```
10 (3 C5/4 D E F G A6 B C)
```

This would play the scale from C to C three times or whatever number succeeds the (sign until a) sign is reached.

The command Nn is used inside the repeat line and means skip the end of the repeat loop for n times and play for the remainder. Note n must be smaller than the repeat number at the beginning of the loop.

An example of this is:

```
10 (3 C5/4 D E F G A6 N2 B C )
```

This will play the scale from C to A twice and the third time it will play the whole scale.

When more than one voice is required to play at one time, synthy will scan forward to the next command and if it is preceded with a voice symbol other than the one being played at the time then that note will be played and the next command will be scanned. For example:

```
10 +C5/4 D –D5/4
```

will play the note C in the first voice on its own and then the note D in both voices 1 and 2 at the same time, therefore allowing pseudo chords to be played. I say pseudo chords because only three notes of the chord may be played as there are only three voices available.

In sheet music, some notes are required to play for a length of time 1.5 times as long as a single note and other extra lengths, so there are three symbols which may be added directly succeeding the note which mean:

. – Extend note time by .5 times duration.

: – Extend note time by .75 times duration.

! – Decrease note time to .677 times duration.

Another command that is entered in the same format as the notes is the Rest command which is set as R/4: this will rest for a quarter note.

Debugging

When any error is reached, synthy will exit the program, tell you what the error was and show the trace display at the point of exit, therefore showing in which line and which position the error occurred. This is a tremendous help when debugging a program. The same display will also appear when the stop key has been pressed so that if a note does not sound right, the exact position of that note can be found and then altered.

Another aspect of sheet music is the need to sometimes tie two notes together when the total duration of the note is more than one. This is done with the   symbol like this:

```
10 C/1 C/4
```

This will play the note C for a duration of 1.25 times note.

The key signature may be selected using the command SGN   n or SGN%n for sharp or flat keys. n is a value from 0 to 11.

Example: SGN   3 – key of G-sharp.

The key of C is the default key if no key is set.

Remarks may be included in the program using the command REM or *. This will make synthy assume that everything following on that line is a remark.

As there is no FOR-NEXT loop available except the repeat loop, there is a command WAITn. This will pause for n seconds before continuing.

Format

Now to play the notes. The format for the notes is vno/d. An example is C5/4 plays middle C to voice 3 for a duration of one quarter of a note. To play C sharp: C   5/4, for a flat: £C%5/4 and a natural: £C$5/4.

A simple program to play a scale would be:

```
1 RUN
2 +@A0 @D9 @S0 @R0 @WP @P8
3 V15 T100 C5/4 D E F G A6 B C
4 END
```

You may have noticed that there are no colons separating the commands; that is because they are not needed using synthy but the commands must be separated with a space. Also the voice designator is only specified once because until either a - or a £sign is found it assumes the same voice. This also applies to the octave number and the duration but they are remembered for the voice concerned until changed.

Equivalent

Along with the commands above, other commands are available such as GOTO, GOSUB, INPUT, RETURN, and a form of PRINT but without the command PRINT. The equivalent of PRINT'hello' in synthy is just 'hello'. The format of commands is very strict; in other words spaces must be where they are expected and not where they are not expected. In Basic, GOTO and GOSUB may have spaces between the command and the line number theyor may not; when synthy is running, the format must be without spaces, thus GOTO11111 and not GOTO 11111.

The input command is the same as Basic only in the way that you are inputting a number, but instead of having an input followed by an ON XX GOTO, the two commands have been merged together to form a single command thus:

```
10 INPUT 1000,2000,3000,4000
20 GOTO 10
```

would allow an input of a number from 1 to 4 and return to input line if outside these values.

There are two other commands available for advanced music programming; they are commands to sweep a scale with no discernible stepping. They are @ n and @;n where n is the multiplier used to determine the rate of sweep.

Direct commands in Basic are as usual with the addition of two commands. These commands are SHIFT K ,RETURN to kill off synthy and SHIFT C, RETURN to clear the music program and leave you with:

```
1 RUN''(CLR)''
63000 REM
63005 REM*******
63010 @WP @P8 @A0 @D9 @S0
      @R0 @F0 RETURN PIANO
63020 @WT @A4 @D2 @S10 @R5
      @F0 RETURN FLUTE
63030 @WS @A6 @D0 @S10 @R1
      ZB X10 Y12 @F1
      RETURN TRUMPET
63040 @WP @P1 @A0 @D9 @S0
      @R0 @F0 RETURN BANJO
63050 @WS @A6 @D5 @S10 @R2
      ZH X8 Y12 @F1
      RETURN ACCORDION
```

This sets up a library of instruments for use in synthy programs that can be called by a GOSUB 630n0 where n is 1-5.

The package SYNTHY-64 plus a number of demonstration music programs on cassette is available to readers of Commodore Computing International for a special price of £7.00.

On the lighter side, below is a listing of a basic loader for a machine code routine for hi-resolution graphics on the 64. The loader has been checksummed every ten lines of data so that if any errors in entering the data occur, only the ten lines need to be checked for the error.

```
 10 REM******************************************
 20 REM*                                        *
 30 REM* THERE ARE FOUR ROUTINES IN THIS LOADER *
 40 REM* 1) SET UP GRAPHICS MODE.               *
 50 REM* 2) PLOT A POINT AT THE DESIRED X,Y     *
 60 REM*    COORDINATE ON THE SCREEN WHERE      *
 70 REM*    TOP LEFT COORDINATES ARE 0,0.       *
 80 REM* 3) DRAW A LINE BETWEEN TWO POINTS ON   *
 90 REM*    SCREEN.                             *
100 REM* 4) PLOT UP CHARACTERS ON THE SCREEN    *
110 REM*    AT THE DESIRED X,Y COORDINATES OF   *
120 REM*    THE TOP LEFT POINT OF THE CHARACTER.*
130 REM******************************************
140 REM* 1) THIS ROUTINE IS SPLIT UP INTO THREE *
150 REM*    PARTS, THE FIRST CLEARS THE 8K BIT  *
160 REM*    MAP MEMORY, THE SECOND SETS THE     *
170 REM*    COLOUR COMBINATIONS FOR SCREEN AND  *
180 REM*    POINT COLOUR, AND THE THIRD SETS THE*
190 REM*    REGISTERS FOR BIT MAP MODE.         *
200 REM*    THE ROUTINE IS CALLED BY            *
210 REM*     POKE 89,SC+16*PC (SC=SCREEN COLOUR)*
220 REM*                      (PC=POINT COLOUR) *
230 REM*     SYS(28672).                        *
240 REM*    THE FIRST TWO PARTS MAY BE CALLED ON*
250 REM*    THEIR OWN WITH                      *
260 REM*    A) SYS(28704)                       *
270 REM*    B) THE ABOVE POKE FOLLOWED BY       *
280 REM*       SYS(28743)                       *
290 REM******************************************
300 REM* 2) THIS ROUTINE PLOTS A POINT ON THE   *
310 REM*    SCREEN WITH THE DESIRED COLOUR      *
320 REM*    IT IS CALLED BY                     *
330 REM*     POKE 89,X-INT(X/256)*256           *
340 REM*     POKE 90,INT(X/256)                 *
350 REM*     POKE 91,Y                          *
360 REM*     POKE 784,AD   (AD =1 FOR PLOT, )   *
370 REM*                    (  =2 FOR DELETE)   *
380 REM*     POKE 879,PC                        *
390 REM*     SYS(28782)                         *
400 REM******************************************
410 REM* 3) THIS ROUTINE DRAWS A HI-RESOLUTION  *
420 REM*    LINE ON THE SCREEN BETWEEN TWO SETS *
430 REM*    OF COORDINATES IN THE DESIRED COLOUR*
440 REM*    IT IS CALLED BY                     *
450 REM*     POKE 828,X1-INT(X1/256)*256        *
460 REM*     POKE 829,INT(X1/256)               *
470 REM*     POKE 830,Y1:POKE 831,0             *
480 REM*     POKE 832,X2-INT(X2/256)*256        *
490 REM*     POKE 833,INT(X2/256)               *
500 REM*     POKE 834,Y2:POKE 835,0             *
510 REM*     POKE 786,AD                        *
520 REM*     POKE 879,PC                        *
530 REM*     SYS(29158)                         *
540 REM******************************************
```

```
550 REM* 4) ROUTINE TO PLOT A CHARACTER ON THE  *
560 REM*    SCREEN WITH X,Y THE TOP LEFT CORNER *
570 REM*    OF THE CHARACTER.                   *
580 REM*    IT IS CALLED BY                     *
590 REM*     FOR I=1 TO LEN(B$)                 *
600 REM*     A$=MID$(B$,I,1)                    *
610 REM*     POKE 866,X-INT(X/256)*256          *
620 REM*     POKE 867,INT(X/256)                *
630 REM*     POKE 868,Y:POKE 869,0              *
640 REM*     POKE 870,ASC(A$)                   *
650 REM*     POKE 871,RN                        *
660 REM*     POKE 879,PC                        *
670 REM*     POKE 784,AD                        *
680 REM*     SYS(29749)                         *
690 REM*     X=X+XX:Y=Y+YY                      *
700 REM*     NEXT I                             *
710 REM*                                        *
720 REM*    WHERE B$ IS THE CHARACTER STRING TO *
730 REM*    BE PLOTTED, XX IS THE X STEP BETWEEN*
740 REM*    LETTERS FROM LEFT TO RIGHT AND YY IS*
750 REM*    THE Y STEP FROM TOP TO BOTTOM.      *
760 REM*****************************************
 1000 I=28672:ER=0:CT=0:PRINT"□"
 1010 T=0
 1020 READ A
 1040 IF A>255 THEN 2000
 1050 IF A=-1 THEN 3000
 1060 T=T+A:POKE I,A
 1070 I=I+1
 1080 GOTO 1020
 2000 REM
 2010 IF T=A THEN 2020
 2012 PRINT"LINES"20000+CT"-";
 2014 PRINT20000+CT+90;T,A:ER=1:GOTO 2030
 2020 PRINT"LINES"20000+CT"-"20000+CT+90"O.K.□"
 2030 CT=CT+100
 2040 GOTO 1010
 3000 IF ER=1THENEND
 3010 POKE51,0:POKE52,112
 3020 POKE55,0:POKE56,112:CLR:NEW
 20000 DATA72,138,72,152,72,32,32
 20010 DATA112,32,71,112,173,17,208
 20020 DATA9,32,141,17,208,173,24
 20030 DATA208,9,8,141,24,208,104
 20040 DATA168,104,170,104,160,0,169
 20050 DATA64,133,87,169,63,133,88
 20060 DATA169,0,145,87,165,87,240
 20070 DATA5,198,87,76,42,112,198
 20080 DATA88,165,88,201,31,240,7
 20090 DATA169,255,133,87,76,42,112
 20095 DATA7518
 20100 DATA96,160,0,169,231,133,87
 20110 DATA169,7,133,88,165,89,145
 20120 DATA87,165,87,240,5,198,87
 20130 DATA76,81,112,198,88,165,88
 20140 DATA201,3,240,7,169,255,133
 20150 DATA87,76,81,112,96,72,152
 20160 DATA72,138,72,160,0,24,152
 20170 DATA133,95,165,90,201,1,144
 20180 DATA12,201,1,208,6,165,89
 20190 DATA201,64,144,2,230,95,165
 20195 DATA8063
 20200 DATA91,201,200,144,2,230,95
 20210 DATA165,95,240,6,104,170,104
 20220 DATA168,104,96,165,89,41,7
 20230 DATA133,94,169,7,56,229,94
 20240 DATA133,94,240,9,168,169,1
 20250 DATA10,136,208,252,240,2,169
```

SOUND & VISION

```
20260 DATA1,133,94,165,91,41,7
20270 DATA133,93,165,91,74,74,74
20280 DATA133,95,133,92,141,109,3
20290 DATA169,0,133,91,133,96,141
20295 DATA7835
20300 DATA110,3,160,6,24,6,95
20310 DATA176,7,6,96,136,208,246
20320 DATA240,6,6,96,230,96,208
20330 DATA245,24,165,91,101,95,133
20340 DATA91,165,92,101,96,133,92
20350 DATA160,3,24,70,90,176,7
20360 DATA70,89,136,208,246,240,10
20370 DATA70,89,165,89,9,128,133
20380 DATA89,208,241,165,89,141,108
20390 DATA3,160,3,24,6,89,176
20395 DATA7499
20400 DATA7,6,90,136,208,246,240
20410 DATA6,6,90,230,90,208,245
20420 DATA169,0,133,87,133,88,165
20430 DATA93,24,101,91,133,87,165
20440 DATA88,101,92,133,88,165,87
20450 DATA24,101,89,133,87,165,88
20460 DATA101,90,24,105,32,133,88
20470 DATA24,160,0,173,16,3,240
20480 DATA15,169,255,69,94,133,94
20490 DATA177,87,37,94,145,87,56
20495 DATA7419
20500 DATA176,6,177,87,5,94,145
20510 DATA87,173,108,3,133,89,169
20520 DATA0,133,90,133,91,133,92
20530 DATA24,14,109,3,14,109,3
20540 DATA14,109,3,173,109,3,133
20550 DATA91,24,14,109,3,46,110
20560 DATA3,24,14,109,3,46,110
20570 DATA3,173,109,3,24,101,91
20580 DATA133,91,173,110,3,101,92
20590 DATA133,92,24,169,0,133,87
20595 DATA5495
20600 DATA133,88,165,89,24,101,91
20610 DATA133,87,165,92,101,88,24
20620 DATA105,4,133,88,173,111,3
20630 DATA10,10,10,10,141,112,3
20640 DATA160,0,177,87,41,15,13
20650 DATA112,3,145,87,169,1,141
20660 DATA17,3,169,0,133,95,104
20670 DATA170,104,168,104,96,189,0
20680 DATA2,201,32,208,1,232,189
20690 DATA0,2,240,72,138,72,152
20695 DATA6338
20700 DATA72,173,64,3,56,237,60
20710 DATA3,141,68,3,173,65,3
20720 DATA237,61,3,141,69,3,173
20730 DATA66,3,56,237,62,3,141
20740 DATA70,3,173,63,3,237,67
20750 DATA3,141,71,3,169,1,141
20760 DATA94,3,141,96,3,169,0
20770 DATA141,95,3,141,97,3,173
20780 DATA71,3,41,128,240,8,169
20790 DATA255,141,94,3,141,95,3
20795 DATA6072
20800 DATA173,69,3,41,128,240,8
20810 DATA169,255,141,96,3,141,97
20820 DATA3,173,69,3,41,128,240
20830 DATA30,173,69,3,73,255,141
20840 DATA73,3,24,173,68,3,73
20850 DATA255,105,1,141,72,3,173
20860 DATA73,3,105,0,141,73,3
20870 DATA76,112,114,173,68,3,141
20880 DATA72,3,173,69,3,141,73
20890 DATA3,173,71,3,41,128,240
20895 DATA6410
20900 DATA30,173,71,3,73,255,141
20910 DATA75,3,24,173,70,3,73
20920 DATA255,105,1,141,74,3,173
20930 DATA75,3,105,0,141,75,3
20940 DATA76,161,114,173,70,3,141
20950 DATA74,3,173,71,3,141,75
20960 DATA3,173,72,3,56,237,74
20970 DATA3,141,88,3,173,73,3
20980 DATA237,75,3,141,89,3,41
20990 DATA128,240,60,169,255,141,90
20995 DATA6373
21000 DATA3,141,91,3,169,0,141
21010 DATA92,3,141,93,3,173,74
21020 DATA3,141,76,3,173,75,3
21030 DATA141,77,3,173,72,3,141
21040 DATA78,3,173,73,3,141,79
21050 DATA3,173,71,3,41,128,208
21060 DATA70,169,1,141,90,3,169
21070 DATA0,141,91,3,76,45,115
21080 DATA169,0,141,90,3,141,91
21090 DATA3,169,255,141,92,3,141
21095 DATA5941
21100 DATA93,3,173,72,3,141,76
21110 DATA3,173,73,3,141,77,3
21120 DATA173,74,3,141,78,3,173
21130 DATA75,3,141,79,3,173,69
21140 DATA3,41,128,208,10,169,1
21150 DATA141,92,3,169,0,141,93
21160 DATA3,173,76,3,141,82,3
21170 DATA173,77,3,141,83,3,173
21180 DATA78,3,141,80,3,173,79
21190 DATA3,141,81,3,173,76,3
21195 DATA5592
21200 DATA56,237,78,3,141,84,3
21210 DATA173,77,3,237,79,3,141
21220 DATA85,3,78,77,3,110,76
21230 DATA3,173,78,3,56,237,76
21240 DATA3,141,86,3,173,79,3
21250 DATA237,77,3,141,87,3,173
21260 DATA18,3,141,16,3,173,60
21270 DATA3,133,89,173,61,3,133
21280 DATA90,173,62,3,133,91,32
21290 DATA110,112,173,87,3,41,128
21295 DATA5829
21300 DATA240,60,173,86,3,24,109
21310 DATA80,3,141,86,3,173,87
21320 DATA3,109,81,3,141,87,3
21330 DATA173,60,3,24,109,92,3
21340 DATA141,60,3,173,61,3,109
21350 DATA93,3,141,61,3,173,62
21360 DATA3,24,109,90,3,141,62
21370 DATA3,173,63,3,109,91,3
21380 DATA141,63,3,76,5,116,173
21390 DATA86,3,56,237,84,3,141
21395 DATA5309
21296 DATA86,3,173,87,3,237,85
21410 DATA3,141,87,3,173,60,3
21420 DATA24,109,96,3,141,60,3
21430 DATA173,61,3,109,97,3,141
21440 DATA61,3,173,62,3,24,109
21450 DATA94,3,141,62,3,173,63
21460 DATA3,109,95,3,141,63,3
21470 DATA173,82,3,56,233,1,141
21480 DATA82,3,173,83,3,233,0
21490 DATA141,83,3,173,17,3,240
```

```
21495 DATA5484
21500 DATA4,165,95,208,16,173,83
21510 DATA3,240,3,76,119,115,173
21520 DATA82,3,240,3,76,119,115
21530 DATA104,168,104,170,104.96,72
21540 DATA152,72,138,72,173,103,3
21550 DATA240,5,169,255,141,103,3
21560 DATA173,102,3,201,31,176,3
21570 DATA76,18,117,201,64,144,14
21580 DATA24,201,96,144,3,76,18
21590 DATA117,56,233,64,141,102,3
21595 DATA7159
21600 DATA169,208,133,252,169,0,133
21610 DATA251,173,102,3,160,3,24
21620 DATA10,141,102,3,165,252,105
21630 DATA0,133,252,173,102,3,136
21640 DATA208,239,133,251,169,8,141
21650 DATA106,3,173,14,220,41,254
21660 DATA141,14,220,165,1,41,251
21670 DATA133,1,160,0.177,251,141
21680 DATA102,3,165,1,9,4,133
21690 DATA1,173,14,220,9,1,141
21695 DATA7989
21700 DATA14,220,173,103,3,240,6
21710 DATA77,102,3,141,102,3,173
21720 DATA99,3,141,105,3,173,98
21730 DATA3,141,104,3,169,128,141
21740 LATA107,3,173,102,3,45,107
21750 DATA3,240,18,173,104,3,133
21760 DATA89,173,105,3,133,90,173
21770 DATA100,3,133,91,32,110,112
21780 DATA78,107,3,240,20,173,104
21790 DATA3,24,105,1,141,104,3
21795 DATA6338
21800 DATA173,105,3,105,0,141,105
21810 DATA3,76,196,116,165,251,24
21820 DATA105,1,133,251,165,252,105
21830 DATA0,133,252,24,238,100,3
21840 DATA176,8,206,106,3,240,3
21850 DATA76,133,116,104,170,104,168
21860 DATA104,96
21870 DATA5038,-1
READY.
```

The final program in this section is a simulation of sprites on the VIC-20. The program requires a super expander hi-resolution cartridge to be in place for the program to work.

The method is to hold the character required in an array and as it is moved, store the contents of the screen in that location into an array. When the character is moved to another postion, the display in the previous sprite position is restored. This enables the character to be moved over the display without destroying it.

The program is set up to move a cursor in the form of a cross over the screen in steps of three. The increment, size of the character and the character itself can be varied to suit the users requirements.

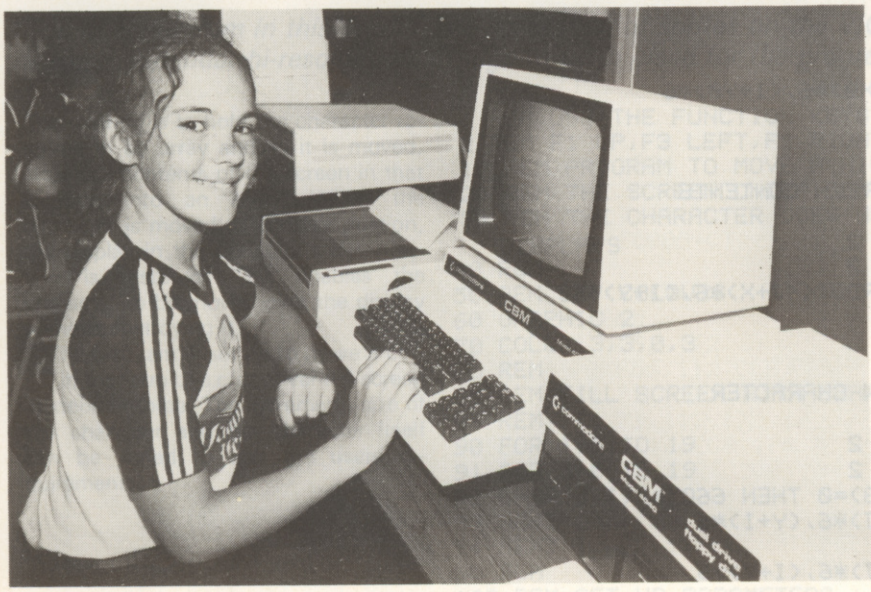
```
1 REM USE THE FUNCTION KEYS TO MOVE THE CHARACTER
2 REM F1 UP,F3 LEFT,F5 RIGHT,F7 DOWN
10 REM PROGRAM TO MOVE A HIGH RESOLUTION CHARACTER ABOUT
20 REM THE SCREEN UNDER CONTROL OF THE KEYBOARD.
30 REM THE CHARACTER DOES NOT ERASE EXISTING SCREEN
 DISPLAYS
40 REM
50 REM SET COLOURS
60 GRAPHIC 2
70 COLOR 3,3,0,3
75 REM
80 REM FILL SCREEN WITH CHARACTERS
85 REM
90 FOR I=0 TO 19
91 FOR J=0 TO 19
92 CHAR J,I,"●"
93 NEXT J
94 NEXT I
95 REM
100 REM SET UP PARAMETERS
105 X=5:Y=5:REM START POSITION
110 S=3:REM CHARACTER MOVEMENT
120 DIM C(5,5),M(5,5)
125 FOR I=1 TO 5
130 FOR J=1 TO 5
135 READ C(J,I)
140 NEXT J
145 NEXT I
150 DATA 0,0,1,0,0
155 DATA 0,0,1,0,0
160 DATA 1,1,1,1,1
165 DATA 0,0,1,0,0
170 DATA 0,0,1,0,0
190 GOTO 500
195 REM
200 REM INPUT CHARACTER MOVEMENT FROM KEYBOARD
205 REM
210 A=PEEK(197)
215 X0=X:Y0=Y
```

```
220 IF A=47 THEN X=X-S:GOTO 300
230 IF A=63 THEN Y=Y+S:GOTO 300
240 IF A=39 THEN Y=Y-S:GOTO 300
250 IF A=55 THEN X=X+S:GOTO300
260 GOTO 210
295 REM
300 REM CHECK CHARACTER WITHIN BOUNDS
305 REM
310 IF X<5 THEN X=5
320 IF X>165 THEN X=165
330 IF Y<5 THEN Y=5
340 IF Y>165 THEN Y=165
395 REM
400 REM ERASE PREVIOUS CHARACTER
405 REM
410 FOR I=-2 TO 2
420 FOR J=-2 TO 2
430 IF M(J+3,I+3)<>0 THEN 460
440 POINT 3,(J+X0)*6,(I+Y0)*6
445 REM
450 GOTO 470
455 REM
460 POINT 4,(J+X0)*6,(I+Y0)*6
470 NEXT J
480 NEXT I
495 REM
500 REM SAVE SCREEN CONTENTS
505 REM
510 FOR I=-2 TO 2
520 FOR J=-2 TO 2
530 M(J+3,I+3)=RDOT((J+X)*6,(I+Y)*6)
540 NEXT J
550 NEXT I
595 REM
600 REM PLOT NEW CHARACTER
605 REM
610 FOR I=-2 TO 2
620 FOR J=-2 TO 2
630 IF C(J+3,I+3)=0 THEN 660
640 POINT 3,(X+J)*6,(Y+I)*6
650 GOTO 670
660 POINT 4,(X+J)*6,(I+Y)*6
670 NEXT J
680 NEXT I
895 REM
900 REM DO AGAIN
905 REM
910 GOTO 210

READY.
```

Footnote: *Because of swapping points the program is rather slow.*

SCHOOL'S OUT FOR SUMMER



Camp Beaumont, held in the Mill Hill Public School, is but one of the fine summer camps for young people created and organised by Stewart Wiley. Beaumont Summer Camps have been held in England for three years, and each year the organisation increases in popularity with both children and parents. The camps are intended for children between the ages of 4, in the 'day crêches', and 17, enjoying interesting and varied activities during the school Easter and Summer holidays.

There are nine camps operating at the moment, but in a short while the tenth, in Nutsford just outside Manchester, will open. Further information as to the locations and timings of all the Beaumont Camps will be given at the end of this article, but for now let us concentrate on the Mill Hill Camp.

Camp Director for Mill Hill is a charming and sincere teacher—Richard Ryde. Richard is also a teacher at the Mill Hill Public School, as are many of his assistants. To round out his staff of 35 are 29 student teachers, all of whom display heartening dedication to improving their interaction with young people. Their enjoyment of the camp is obvious to all observers—casual or deeply interested—and is only surpassed by that of the children themselves.

The children attending a Beaumont Summer Camp, whether for a day, two days or a week, are encouraged to learn skills and enjoy activities that may not have been in their sphere before. There are over 30 different activities as listed below:

Mini-Motor bikes
Canoeing
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Kite Flying
Scuba Diving
Scavenger Hunts
Gymnastics
Jazzercise
Pony Trekking
Fishing
Sailing
Windsurfing
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Film-making
Painting
Volleyball
COMPUTING

All activities in heavy type have an option for the child to take a more intensive course in that subject.

All sports are expertly supervised and the safety records of all Beaumont

Camps are extremely good, apart from the usual tumbles in any child's day.

Last year Camp Beaumont introduced computing courses to just one of their camps as a trial and found the response overwhelming. In consequence, this year they have opened new camps to accommodate the demand.

Overall Camp Director Stewart Wiley must be thanked for this—the first holiday for children mixing both healthy out-door activities and computing together. For Camp Beaumont Mill Hill, Mark Line—an expert computer specialist—has been drafted in from Germany to create the right teaching methods to enable the child to learn at his/her own pace, and, from the thundering cheer the children gave when asked their opinion, he is obviously doing a wonderful job.

The children have a choice of computers to work with—16 VIC-20s, 10 of the elusive CBM64s, 4 4032 PETS, one robot and all the necessary peripherals the children could want. As an added bonus for the children there is the option of taking away one of the camp Commodore machines at half the shop price at the end of their visit (subject to parental consent). The maximum time that any child may use the machines during the day is 2½ hours, thus not contravening the time limit allowed by law.

The ratio of supervisors/monitors to children is carefully worked out. In the case of the younger children it is one adult over the age of 18 : 4-6 children, for the older children the ratio is one adult over the age of 18 : 8-10 children. On each camp there is a resident matron who is medically qualified to handle all but the most serious of accidents (of which to date there has been none).

Altogether the whole package is one of value for money, but the greater value is that afforded to the children and parents. The children emerge happy, pleasantly tired, fit and a little maturer in their attitudes. The parents benefit by their own holiday from the demands of parenthood and welcome their children home with refreshed and loving arms.

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HARDWARE REVIEW

The Smart Communicator

Interpod for Vic 20 & Commodore 64

One of the problems with using either the Commodore 64 or the VIC-20 is that neither has, as standard, an IEEE connector. Indeed, communicating with any external device, unless it happens to be one of Commodore's own disk drives or printers, is not the easiest of tasks.

To our rescue comes Oxford Computer Systems, with a device called Interpod. So, this month let's take a look at Interpod, and see if it measures up to the claims of its manufacturers.

First Encounters

Interpod consists basically of a smart, small and light white box, measuring just over 6 by 1 by 4 inches, and weighing in at 1.25 lb.

It is designed to be accessed from either a VIC-20 or a Commodore 64, either of which can be connected up via the serial port, which is normally reserved for Commodore's own disk drives and/or printers. There are two serial ports in Interpod itself, serial in and serial out. A third, similar looking port is in fact nothing more important than the power supply. Okay, it is important!

Two other connectors complete the family, namely an IEEE port (Commodore IEEE that is, not the real thing), and an RS232-C one. Communicating via the RS 232 is rather simple, as it has a reserved device address number, normally 4, and thus can be treated just as you would a printer, say.

As the more expensive daisy-wheels tend to be RS232 driven anyway, this should present the user with no unacceptable and unfamiliar problems. The other connector, the IEEE one, is the one which would be of most interest to Commodore users : think of all those lovely disk drives just waiting to be accessed! So, we'll take a look at that one first.

Down the IEEE Line

This is a full implementation of Commodore's own peculiar brand of IEEE, but the fact that it's fully compatible with Commodore is all we need to worry about. To use it is beautifully simple; all you have to do is connect your 64 or VIC-20 at one end, and your IEEE device at the other. For example, we could have Commodore's own 8050 disk drive plugged straight in to Interpod and a Commodore 64 coming out of the other end.

From then on you just type away as if Interpod wasn't there : its use becomes totally transparent, as you merrily swop files from disk to machine and back again. Very straightforward, and very easy.

Ditto with RS232. Just plug in your device and communicate with it as you would normally. You have a choice of baud rate here, depending on what your peripheral device will handle and accept, and this ranges from a miserly 50 baud (I know people who can talk faster than that!) up to a much more respectable 7,200. Everything else is equally selectable, including parity, stop bits and word length, and on power-up it all defaults to device 4, communicating at 1,200 baud, with 8 bits and 1 stop bit (no parity).

If you attempt to access a device on the serial bus which isn't there, Interpod then searches along the parallel one. And if it doesn't find it there, a friendly error message comes back and tells you, basically, to plug something in.

Presumably, although this couldn't be tried here as we only had one Interpod to play with, they could be connected together in series, and thus have a link something like VIC to Interpod to disk drive, then onto another Interpod and a 64 at the end of it all.

Careful playing with device numbers could then possibly allow you to communicate from a VIC to a 64 and back again. However, whether anyone would want to pay £250 for the privilege of doing this is another question.

Conclusion

Interpod is extremely easy to use, and in use becomes transparent to the person sitting at the keyboard. It is neat, lightweight and very compact : mind you, it should be, as there is very little inside it! Its own 6502 takes care of everything.

Documentation is sparse, but then that doesn't matter. There's hardly an awful lot that you could do wrong.

To sum up, it fills a hole in the Commodore industry that should have been plugged some while ago, and makes the VIC and (especially) the Commodore 64 into viable business computers.

I can think of no greater praise for a product than to say, having had one in the office here to review, if Oxford Computer Systems want it back they're going to have to prise it out of us!

Product: *Interpod.*
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BOOK REVIEW

Programmer's Guide to the 6502 Micro

6502
applications
Rodnay
Zaks
SYBEX

Accompanying the Sybex publications 'Programming the 6502' and '6502 Games', comes another gem from Sybex called '6502 Applications', the author of which, Dr Rodney Zaks, has given courses on programming and micros worldwide. The aim of the book is to design programs for the 6502, the user being helped along by a series of over 50 exercises designed to test your skill every step of the way, the programs in the book being applicable to any 6502 micro.

The problem with some of these books is that the user will buy them without realising that he hasn't got half the hardware required to put the programs to any use. Is the reader likely to fall into the same trap in this case?

Well I'm glad to be able to tell you that this is unlikely. From the outset, Zaks stresses that the main aim, assuming an elementary knowledge of micro programming, is to address the problem of writing applications that require the implementation of the minimum of actual hardware.

Concise

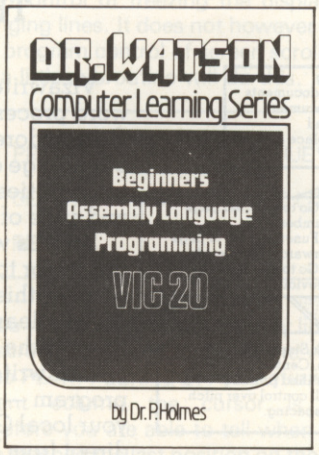
The chapters, of which there are seven followed by six informative appendices and an index, are very concise and essentially self-contained in subject. For example, chapter two deals with input and output chips but it is not necessary for the reader to understand all the principles of the PIO to start reading chapter three. If you still have the AIM 65 (Additional Input Monitor) board and do not want to bother with the SYM board or the outdated KIM, then you can virtually skip to the 'meat' of the book in chapter four.

This is where the well-illustrated book becomes really interesting, going through the basic techniques on how to build relays, switches and speakers. Such step by step applications are accompanied by helpful diagrams, photographs and program listings. Following on from this, Zaks goes in to more complex home and industrial applications such as A/D convertors and complete burglar alarms.

Not all the input/output devices are covered although any book would be hard pressed to cover the whole range. If you do not have this book, then you really are missing something.

Title: *6502 Applications.*
Price: *£10.25.*
Author: *Dr Rodney Zaks.*
Publisher: *Sybex.*
Available from: *The Computer Bookshop, 30 Lincoln Road, Olton, Birmingham B27 6PA.*
Tel: *021-707 7544.*

Holmes and Watson Assembly Language



The second book to be reviewed this month is a successful follow-up to the 'Dr Watson Book of Assembly Language Programming for the Commodore PET 2/3/4/8000' which ran to two editions. Called 'Beginners Assembly Language Programming VIC-20', this addition to the Dr Watson series was written by Dr Holmes and is already into its third edition (revised format).

For the complete beginner to assembly language it is a must to thoroughly understand the introduction and the ensuing chapters. Holmes goes to great pains to explain the principles and techniques concerned with assembly and machine code, kicking off with loading, debugging and running the assembler. This embraces a complete assembly listing accompanied by an error message reference guide, advice on SAVEing the program and what to do if it crashes. As a safety valve, if any errors do creep in there is a very simple and short program designed to clear them.

More Advanced

At this stage of the book, the listings are very simple — take Holmes' example of adding one and two together. Naturally as the book progresses, the subject material gets a little more advanced, an example of this being to extend the operation to add one and two together so that it covers a wider range of numbers using the C flag, explaining that with one byte you can count up to 255; larger numbers are accounted for by adding more bytes.

The obstacles presented by hexadecimal input and binary are overcome, as is the technique of providing M/C programs with colour and sound. After giving solutions to the various exercises and an abundant range of appendices, the author finishes with the USR command and the use of signed and floating point numbers.

Considering the book and tape are supplied directly for £14.95, this book is worth its weight in gold. If there was ever a good beginner's guide in this field, then this is it.

Title: *Beginners Assembly Language Programming VIC-20.*
Price: *£14.95.*
Author: *Dr P. Holmes.*
Publisher: *Glentop Publishers Ltd.*
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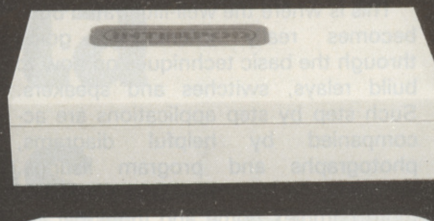

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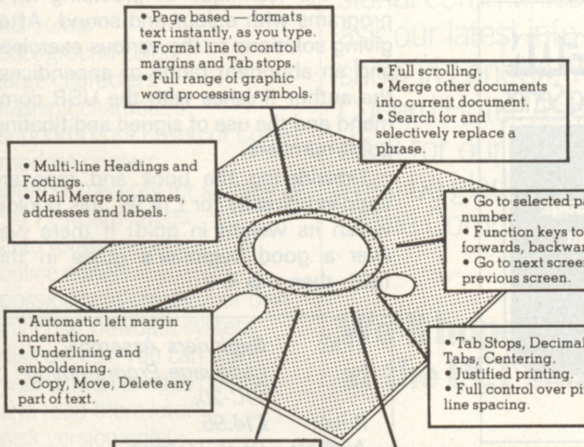

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The Function Mystery

Included in this month's hints and tips for the VIC and the 64 are notes on screen control, a disable routine and what to do when the 1540 disk drive protests too much.

Here's a little program for the VIC:-

```
10  PRINT"<clr>TO RESET YOUR VIC"
20  PRINT"<cd>WITHOUT POWERING DOWN"
30 PRINT"<cd>YOU CAN USE SYS(64802)
40 PRINT"<cd>THIS RESETS THE VIC,"
50 PRINT"<cd>BUT LEAVES ANY MACHINE"
60 PRINT"<cd>CODE IN MEMORY THERE."
70 PRINT"<cd>   USUALLY!!"
80 PRINT"<cd>  LET'S TRY IT"
90 PRINT"<3cd,spc,rvs,spc>HIT 'F1' KEY<off>"
100 GETA$:IFA$<>"<F1>"THEN100
110 POKE 198,1:POKE 631,13
120 PRINT"<clr,22cd>":PRINT"<wht.>GOTO 1000"
130 PRINT"<home,blue>":LIST60-
1000 PRINT"<blue>":FOR Z = 1 to 1000:NEXT:SYS(64802)
```

A brief explanation of the program. The control characters are: cd = cursor down, clr = clr home, rvs = reverse key, off = reverse off, f1 = the top function key, wht and blue refer to colour keys.

Lines 10 - 90 explain that SYS 64802 is the power up call and that it will reset the machine but seems to leave machine code in memory. Perhaps someone could write in telling us why this is so? Line 100 waits for the f1 key to be pressed. Line 110 puts one character into the keyboard buffer and tells the VIC that the character is a carriage return.

Line 120 prints in white GOTO 1000, 22 lines from the top of the screen. Line 130 goes to the top of the screen, changes output colour to blue then lists the program from 60 onwards. After a list command any program will stop; thus the program stops with the cursor on the statement GOTO 1000. When a program has finished execution the keyboard buffer is emptied; in this case it now executes a carriage return on GOTO 1000 and re-enters the program. Line 1000 is a delay loop and then the cold start command. Crude, I know, but it does work, perhaps some readers have better ways of doing the same thing; if so please let us know.

Screen Control

Some more information for the VIC this time on screen control. There are two useful locations in the VIC to aid screen control. The first is Dec. 214 hex $00D6; by PEEKing this location you can discover the line the cursor is on: 'PEEK(214)'. This allows a program to have control of freezing the display or changing lines. It does not however give you program control of screen scrolling, but a little subroutine will do this.

```
100 PRINT"HIT Z TO CONTINUE"
200 GET A$:IF A$<>"Z" THEN 200
300 RETURN
```

You may of course stop on any line of the screen by simply adjusting the value of the PEEK. PEEKing 211 will return the current column the cursor is on. Therefore you are able to tell when you have reached the last position on the line and can control things like text display, character position etc. You can use a combination of these POKES and PEEKS to control the entire screen display, but beware, 'there are other addresses' you must also adjust: addr. 201 -cursor log (row) and 202 - input cursor log (column), as well as addresses 209-210 pointer to screen line, to change the cursor position.

Disable Routine

Next a useful little routine for the VIC. There are many times when it would be very useful to disable the RUN-STOP RESTORE keys. The following routines will do this:

```
POKE 808,PEEK(808)+2:POKE37150,PEEK(37150)AND127
The above line disables
POKE 808,PEEK(808)-2:POKE37150,PEEK(37150)OR127
The above line enables
```

Address 808 is the test stop vector and address 37150 is the interrupt register. Another interesting goodie! To make all keys repeat POKE 650,128, to restore to normal POKE 650,0. If after transferring the character memory by, POKE 36869,255, you wish to print recognisable characters you merely PRINT them in reverse. So POKE 36869,255:PRINT' rvs THE VIC STILL PRINTS off ', will print as normal, while the rest of the screen looks slightly disturbing.

This only seems to work for upper case characters; you can also still POKE characters to the screen by using their reverse equivalent, e.g. numbers from 128-255 will give a reverse field character when POKED. If you are using a VIC with more than 8k change POKE36869,255 to POKE36869,207. This can save you time and memory when programming.

Another little quirk for the VIC address 37159 is Timer one; it is usually set at 72; if you poke it with a number lower than this the IRQ will be accessed more often; thus slowing down BASIC's speed. If it is POKED with a number larger than 72 the IRQ is accessed less and BASIC speeds up. Therefore POKE37159,255 will access the IRQ the least, but be cautious when using this as it will affect the internal clock, change the cursor blink rate and POKEs and PEEKs to the screen.

64 Addresses

Now for a few small tips for the 64. A most useful address is hex $FCE2 or decimal 64738, so that SYS(64738) resets your 64. Address 0 and address 1 are also very interesting and useful, but beware of casually altering these addresses as they are rather unforgiving. In fact after my first few attempts at alter-

HINTS & TIPS

ing address 1 I considered writing an article entitled (101 ways to crash your 64). Anyway here is a short prog to control tape:

```
10 A=PEEK(1)OR32:B=PEEK(1)AND16

20 POKE 192.A:POKE1,A:REM will stop tape motor

30 PRINT"<clr>TAPE MOTOR STOPPED"

40 IFB<>0THEN60:REM if no switches down then jump to 60

50 PRINT"<3cd>PRESS STOP ON TAPE"

60 IF(PEEK(1)AND16)=0THEN60

70 PRINT"ALL SWITCHES OFF"

80 END
```

Before explaining the program let's have a look at address 1. It is the 6510 On-chip 8-bit input output register. Bit 0 = loram signal (for switching in or out the Basic ROM). Bit 1 = hiram signal(for switching in or out the Kernal ROM). Bit 2 = character ROM (switch in or out character ROM). Bit 3 = cassette data line. Bit 4 = cassette switch sense (look for tape switch, open or closed). Bit 5 = cassette motor control (turn motor on and off). Bits 6 and 7 are undefined.

So as you can see this is a very powerful address. In the above program A is set to equal the contents of bit 5 (cassette motor control). B is set to equal the contents of bit 4 (the cassette switch sense). Line 20 POKEs A into both 192 and 1. The reason for POKEing A into 192 is because it is the tape motor interlock address. Therefore to stop the tape motor one needs to change Bit 5 in address 1 and the value in location 192.

It seems also advisable to use a variable for any PEEK of address 1, as the 64 tends to be too quick and overwrite your change if you don't. Line 20 will stop the tape motor. Line 30 is obvious, line 40 tests to see if Bit 4 (cassette switch sense) is set to 16 (no key pressed on tape), if not then line 50 asks you to press stop on tape and line 60 tests again to see if it has been pressed (if bit 5 still 0 then key down and stay there until released). Line 70 simply tells you that there are no keys down on cassette.

To find the current value of each bit in location 1, you merely look at the bit. For those of you not accustomed to the method of doing this, PRINT PEEK(1)AND1 will give you the value of Bit 0. PRINT PEEK(1)AND2 will give you the value of Bit 1. PRINT PEEK(1)AND4 will give the value of Bit 2. PRINT PEEK(1)AND8 will give the value of Bit 3. PRINT PEEK(1)AND16 will give the value of Bit 4. PRINT PEEK(1)AND32 will give the value of Bit 5.

So staying with address 1, if you POKE1,PEEK(1)AND254 this will take out the basic ROM. Unfortunately, this is not possible from Basic as the 64 does a warm start and resets address one. Also if you POKE1,PEEK(1) AND253 this switches out the Kernal ROM and again cannot be done from Basic; however, if you have now tried you have crashed your 64 and will need to turn off and back on again. Both bit 0 and bit 1 can only be called by machine code routines, (unless anyone can tell me another way of doing it?). Bit 2 also crashes the machine if used from Basic. Therefore one should be very wary when using this address.

Here is a machine code routine to bank in another 8k of RAM.

Addresses are in HEX:

```
7000 START    LDA $01

7002          AND #$FE

7004          STA $01

7006          RTS
```

The above gives you another 8K RAM. Your programs can now reside from Hex $0800 - CFFF or decimal 2048 -53247.

```
70A0 CLEAR    LDA $01

70A2          ORA #$01

70A4          STA $01
```

This routine as mentioned before is only useable in machine code and you will need a monitor or an assembler to do this. Here is a routine that switches in the character generator ROM, reads it into RAM, switches out the generator ROM and switches the video chip back in.

```
10 CS=12288

20 POKE 56334,PEEK(56334)AND254

30 POKE 1,PEEK(1)AND251

40 FOR I = CS TO CS + 2047

50 POKE I,PEEK(53248+I-CS)

60 NEXT I

70 POKE 1,PEEK(1)OR4

80 POKE 56334,PEEK(56334)OR1

90 POKE 53272,(PEEK(53272)
   AND240)+12
```

Line 10 is the start in RAM of the new character generator. Line 20 and 30 switch in the character generator ROM. Line 40 is the loop needed to read in all 256 characters. Line 50 reads in all 256 characters. Line 60 end of loop. Line 70 and 80 switch out character generator ROM. Line 90 reads characters from generator now in RAM instead of ROM. While the new character generator is in use you cannot use the 64's original character generator. To read from ROM POKE 53272,21.

Using the 1540

One last interesting piece of information for those of you with a 64 and a 1540 disk drive (or access to one). I believe this originally came via Jim Butterfield and may well be known to you.

There is a problem when trying to use the 1540 with the 64. It seems to be the fact that if you use the 1540 as normal with the 64, it will keep trying to refresh the screen and the 1540 will hang up and carry on whirring wildly, seemingly doing nothing. If you blank off the screen before attempting to load or save from the 1540 you can now use it with success. The way to do this is to POKE53265,11 (this will blank the screen). POKE 653265,27 (this will bring back the screen). Obviously you will be typing blind after the screen is blanked, so it is advisable to set the screen up before you start so that by hitting RETURN you can blank the screen,

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HINTS & TIPS

LOAD (SAVE or VERIFY), as well as bring the screen back. To do this you lay the screen out so:

```
POKE 53265,11  (REM:TOP LINE OF SCREEN)
(leave blank)
(leave blank)
LOAD"<prog.name>",8 (REM:LOAD PROG)
(leave blank)
(leave blank)
(leave blank)
(leave BLank)
POKE 53265,27 (REM:BRING SCREEN BACK)
```

To set the screen up without actually executing the statements, start at the top and after typing POKE53265,11, DO NOT press RETURN, but press SHIFT RETURN; this takes you to the next line down without execution of the statement. You can then carry on leaving two blank lines, LOAD your program, leaving four blank lines, the POKE to bring back the screen. One last SHIFT RETURN then PRESS the HOME key UNSHIFTED; this takes you to the top of the screen and you may now simply execute the statements by hitting RETURN. If you make a mistake you can hit RUN-STOP RESTORE to bring the screen back, or you can buy yourself a 1541 (for the 64) and forget about the above. Good luck with this!

We have been using it successfully.

Dual Format

Our editor has recently received a NORMAL 5¼ inch disk, with some music routines on it. So far nothing unusual until we noticed it had been formatted on both sides. On one side it was 8050 formatted and on the other it was 1540 formatted. We tried this with an old disk and it seems to work, but we don't understand why it should. If any of our readers do understand or have any ideas on the subject, please let us know.

Input Routine

Lastly, the start of a program that could be turned into a word proccessor or any other use that you may be able to think of. This routine will work on any Commodore machine.

```
10 OPEN 4,0:
REM OPEN KEYBOARD AS A DEVICE
20 PRINTCHR$(147);:
REM CLEARS THE SCREEN
30 DIM A$(100):REM SET UP ARRAY FOR TEXT STORAGE
40 FOR I = 0 TO 100:REM INPUT LOOP FOR TEXT
50 PRINT:REM SKIP TO START OF NEXT LINE
60 IFA$(I) = "" THEN I = 100:REM TEST FOR END OF
INPUT OF TEXT
70 NEXT:REM END OF INPUT LOOP
100 FOR I = 0 TO 100:REM PRINTING OF TEXT LOOP
110 IFA$(I) = "" THEN 300:REM TEST FOR END OF
PRINT LOOP.
120 FOR J = 1 TO LEN(A$(I)):REM LOOP FOR
LENGTH OF STRING
130 B$ = MID$(A$(I),J,1):REM B$ = Jth CHARACTER
FROM STRING
140 IF B$ = "!" THEN PRINT:GOTO 200
150 REM DO CARRAIGE RETURN IF EXCLAMATION MARK
160 PRINT B$;:REM PRINT CHARACTER OF TEXT
200 NEXTJ,I:REM CLOSE LOOPS
300 CLOSE4:REM CLOSE KEYBOARD CHANNEL
400 END
```

This program when running will not produce a prompt. It will wait for any input (max 88 chars). It will then carry on inputting until you RETURN on a blank line. It will then print out the text on the screen in the format that you input it.

This is just a simple start at using the keyboard to input,display and format text on the screen. There are obviously much better ways of doing this and we will be grateful for both comments and updates, the idea being to explore the possibilities with the keyboard.

We hope to have a regular hints and tips section for all the Commodore machines. So any little routines that you have, if you think they are useful or ingenious then please send them to us and we will incorporate them (with a credit) in this section. Until next month I hope you enjoy and find useful the information and routines included this month.

A worthy addition to our 'hints and tips' section is this program for the 64 which is a machine code routine to define the four functions keys. It comes in the form of a BASIC loader and is therefore easy to understand for those of us who are not experts in machine code. The program listing is included below.

Now for a breakdown of the working of the program, for those readers who may wish to know how it 'functions' and possibly improve or change it. If you do come up with any brilliant ideas please let us know. Line 1 jumps to the routine that loads the code into memory. Lines 2-9 inclusive are the strings that give you the functions. The numbers in F$ do not correspond to the function key numbers. But they are related to the ASCII values of the function keys. Line 10 calls the machine code routine which is wedged into the Interrupt. Line 20 sets V as the starting location for the function key data. Lines 30-60 POKEs the function key data one character at a time into memory and then ends the program. Lines 200-280 contain the data for the machine code routine. Lines 300-330 reads the machine code data into variables (including Z as an error check), then POKEs the data into memory. If there is no error the routine returns to the main program.

There is no doubt that this is a useful program and although it is not easily changeable it should not be impossible to utilise it to add other commands to the function keys, or indeed key commands to other parts of the keyboard.

A simple looking but very useful routine included here for the VIC. The program uses the WAIT command to test for Joystick Fire button to be pressed. Line 1000 displays a message which assumes

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HINTS & TIPS

that a game is being played. Line 10010 clears any previous fire button presses. Line 10020 WAITs for either FIRE button pressed or FIRE button released. This way the WAIT command can check for the relevant BIT and restart the program if the BIT is on or off. Thus this routine could obviously be useful for a number of applications, including games, sketching and educational use.

Two functionally identical routines are provided here for bi-directed scrolling, one for the VIC and one for the 64. Line 10000 sets ADDRESS to the start of BASIC. Line 10010 sets LINE to the next line number or the previous line number, depending on the input at Line 11000. Line 10020 clears the screen and prints in the background colour both LIST and LINE. Line 10030 POKEs into the keyboard buffer a HOME, CURSOR down, CHARACTER colour, carriage RETURN, CURSOR down, carriage RETURN and puts the number of characters into the keyboard buffer. Lines 11000-11020 is a loop for the input of plus and minus data and gets the input and if none or not a plus or minus sign returns for input. Line 12000 checks for the beginning of the line, and lines 12010-13000 are the set addresses for plus or minus input. Line 13005 checks for the start of a new line and if it is not, line 13010 inputs the text of the line data. The effect when using this routine is to be able to LIST your programs on line at a time either down the program or up by pressing plus for one forward and minus for one back. A very useful routine to tag onto the end of a program to aid debugging. Have fun with it!

```
9999 REM +/- LIST FOR 64
10000 ADDRESS=2048
10010 LINE=PEEK(ADDRESS+3)+PEEK(ADDRESS+4)*256
10020 PRINT"□■GOTO11000":PRINT"LIST";LINE;
10030 POKE631,19:POKE632,17:POKE633,159:POKE634,13:POKE635,19:POKE636,13:POKE198
,6:END
11000 IFPEEK(197)=40THEN12000
11010 IFPEEK(197)=43THEN13000
11020 GOTO11000
12000 IFPEEK(ADDRESS+5)<>0THENADDRESS=ADDRESS+1:GOTO12000
12010 ADDRESS=ADDRESS+5:GOTO10010
13000 ADDRESS=ADDRESS-1
13005 IFPEEK(ADDRESS)=0ANDPEEK(ADDRESS-4)<>0ANDPEEK(ADDRESS-3)<>0THEN 10010
13010 GOTO13000
```

```
9999 REM +/- LIST FOR VIC-20
10000 ADDRESS=PEEK(44)*256+PEEK(43)-1
10010 LINE=PEEK(ADDRESS+3)+PEEK(ADDRESS+4)*256
10020 PRINT"□■GOTO11000":PRINT"LIST";LINE;
10030 POKE631,19:POKE632,17:POKE633,31:POKE634,13:POKE635,19:POKE636,13:POKE198,
6:END
11000 IFPEEK(197)=5THEN12000
11010 IFPEEK(197)=61THEN13000
11020 GOTO11000
12000 IFPEEK(ADDRESS+5)<>0THENADDRESS=ADDRESS+1:GOTO12000
12010 ADDRESS=ADDRESS+5:GOTO10010
13000 ADDRESS=ADDRESS-1
13005 IFPEEK(ADDREQS)=0ANDPEEK(ADDRESS-4)<>0ANDPEEK(ADDRESS-3)<>0THEN 10010
13010 GOTO13000
```

```
10 FORI=0TO64:POKE868+I,I:NEXT I
20 PRINT"TYPE OLD KEY FOLLOWED BY NEW KEY"
30 GETOK$:IFOK$=""THEN30
40 OK=PEEK(203):IFOK=39THEN1000
50 PRINTTAB(10);OK$;"=";
60 GETNK$:IFNK$=""THEN60
70 NK=PEEK(203)
80 PRINTNK$
90 POKE867+OK,NK
100 GOTO 30
1000 DATA 120,8,72,138,72,169,81,141,143,2,169
1010 DATA 3,141,144,2,104,170,104,40,88,96
1020 DATA 8,72,138,72,166,203,189,99,03,133
1030 DATA 203,104,170,104,40,76,220,235,-1
1035 I=828
1040 READA
1050 IFA=-1THENSYS828:END
1060 POKEI,A:I=I+1
1070 GOTO1040
```

```
10000 PRINT"□QQQQQQQQQQ■ PRESS FIRE BUTTON TO        PLAY AGAIN       ■"
10010 WAIT 37137,32
10020 WAIT 37137,32,32
10030 REM PLAY GAME AGAIN
10040 END
```

BUSINESS AND PLEASURE ON THE 64!

The Commodore 64 is the ideal machine to combine business with pleasure. It has a typewriter keyboard and lots of memory — ideal for word processing or financial planning — plus some rather clever colour and sound chips that are just what you need for realistic arcade action.

BUSICALC is just the program for those who need to juggle with figures. You could use it to plan your household finances or your personal tax — but it's equally capable of handling much larger figures. If you've got a printer you'll be able to produce reports that are good enough to put before the board (or the bank manager) — but a printer isn't necessary, and neither is a disk drive. BUSICALC costs just £39 plus VAT on tape, or £40.50 on disk; there are versions at the same prices for the PET and VIC-20 (with 16k expansion).

The best word processor you can buy for the 64 is VIZAWRITE. The first thing you'll like is being able to use it right away — you won't have to re-read the manual ninety-four times to find out how to get started. The next is the wide range of printers you can use from the VIC printer to a Diablo or Qume — plus many others in between (like the Epson). Virtually any parallel printer can be operated off the User Port for the price of a simple cable, and features such as underlining, superscripts, subscriptions, and emphasised printing are easily accessed. Formatting on screen means that you can see the text as it will print before it prints — and this isn't the only resemblance between VIZAWRITE and dedicated word processing stations costing £10,000 or more. VIZAWRITE costs a mere £69 plus VAT on disk; a tape-based version should be available very soon.

MIKRO ASSEMBLER plugs into the cartridge port of the 64. As PET and VIC owners are already well aware, MIKRO makes writing machine code programs almost as easy as Basic, because it is a real assembler with LABELS. To help you write your program MIKRO has AUTO, DELETE, and FIND commands; to help you debug it there's a machine code monitor; and you can DISASSEMBLE from Basic or in the monitor! The TABLE commands displays or prints an alphabetically sorted symbol table after assembly — which is really fast (MIKRO will assemble 2k of code in just 20 seconds). If you are writing more than (say) 4k of code you may have to split your source code into several files, but MIKRO will automatically link these together at assembly time, loading them from tape or disk as appropriate. The MIKRO module costs £50 plus VAT; it could be the best investment you ever make.

With ARROW installed in your 64 the Commodore cassette unit LOADS AND SAVES PROGRAMS SEVEN TIMES FASTER! Almost as fast as the 1541 disk, in fact. There is however a small difference in price — because ARROW costs just £39 plus VAT. ARROW has its own load and save commands, so you can still load and save at normal speed if you should want to. ARROW is a tried and tested product that we've been selling on the PET for several years; now 64 owners can also benefit.

Now for the lighter side of our range. TANK ATAK, KAKTUS and MANGROVE are arcade games with colour and sound; a joystick is recommended, but is not esential. They each cost £8 plus VAT on cassette or £9.50 on disk. THE HITCH-HIKER'S GUIDE TO THE GALAXY is an adventure based (with the kind permission of Douglas Adams and Pan Books) on the characters and scenarios in the popular series. If you divide the price of £12 plus VAT (£13.50 on disk) by the number of hours you'll spend exploring the galaxy the answer will be a very small number indeed!

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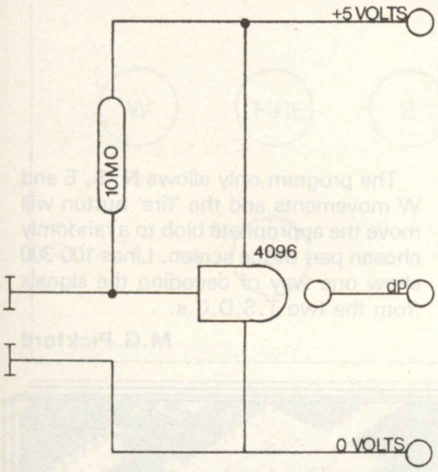
A Replacement for the VIC Joystick

A joystick is a switch which has ten possible positions, eight compass bearing positions, a 'fire' button and a central off. The currently available joysticks for the VIC cost approximately £20.00. I therefore decided to build my own. I also decided that two joysticks would be advantageous.

Fig 1



On constructing various prototypes, the main problems were positioning the switches and the universal joint at the bottom of the stick, not to mention its final appearance. It was during the construction of these prototypes that the idea struck me to remove all moving parts and use touch sensitive switches instead.

Figure 1 shows a simple touch sensitive switch using a 4096 c-mos buffer. When the two contacts are touched at the same time, using a finger, the voltage at the input of the buffer is pulled low, because the skin resistance is much smaller than the 10 megohm resistor. With this low voltage on the input the output switches to a logic 1. When the finger is removed the resistor pulls the input to a logic. and the output then switches to a logic 0.

This output can be used to drive the user port on the VIC. The 4096 i.c. contains six such buffers; four of them are used for the N, S, E and W switches. The output of these is wired to the least significant bits of the user port. This leaves room for another T.S.D.C. on the four most significant bits.

Figure 2 shows the complete circuit diagram. As can be seen the pull-up resistors of the four inputs go to one of the outputs of the two remaining buffers, which are wired in series. This is for the fire button. With no contact on the fire button the output is always at 5 volts, in which case the four gates operate as normal. When the fire button is touched all inputs are driven low and hence all outputs are driven high.

Figure 3 shows the codes obtained from the circuit, if wired as shown.

Construction

The circuit of figure 2 is assembled on vero board or similar. Brass drawing pins were used for the touch-sensitive areas which were pressed through a plastic box (e.g. an old cassette case). Two drawing pins were fixed underneath the box so as to make contact with the user's palm. These were wired to the 0 volt rail. The drawing pins on the top are positioned as shown in figure 4.

Fig 2

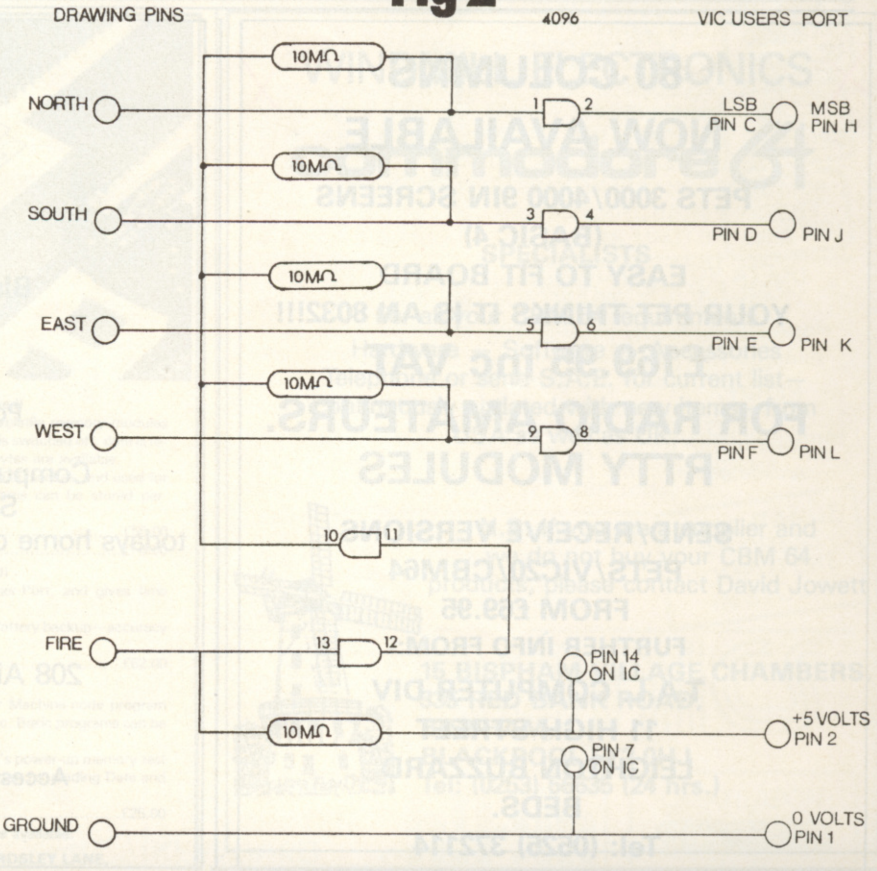


Fig 3

```
                                         Assuming connections are wired as fig 2
--------------------------------------------------------------------------------------------
         Code                          Code
T.S.D.C. 1 LSB                  T.S.D.C. 2 MSB       Command

         0                              0            No movement
         1                             16            North
         2                             32            South
         3                             48            Invalid
         4                             64            East
         5                             80            North East
         6                             96            South East
         7                            112            Invalid
         8                            128            West
         9                            144            North West
        10                            160            South West
        11                            176            Invalid
        12                            192            Invalid
        13                            208            Invalid
        14                            224            Invalid
        15                            240            Fire
```

Software

A demonstration program is shown in figure 5. The object of the game is to chase and devour your opponent—but only if you are large enough! Two blobs appear on the screen, both of which have separate T.S.D.C.s. The large blob can eat the hollow blob. The hollow blob must eat the green power pill, which will find a new position on the screen every 10 seconds. Once the hollow blob has eaten this pill, the hollow blob becomes the big blob and vice-versa. Now the chaser becomes the chased. If the large blob eats the pill by mistake, the same-change over happens.

The program only allows N, S, E and W movements and the 'fire' button will move the appropriate blob to a randomly chosen part of the screen. Lines 100-300 show one way of decoding the signals from the two T.S.D.C.s.

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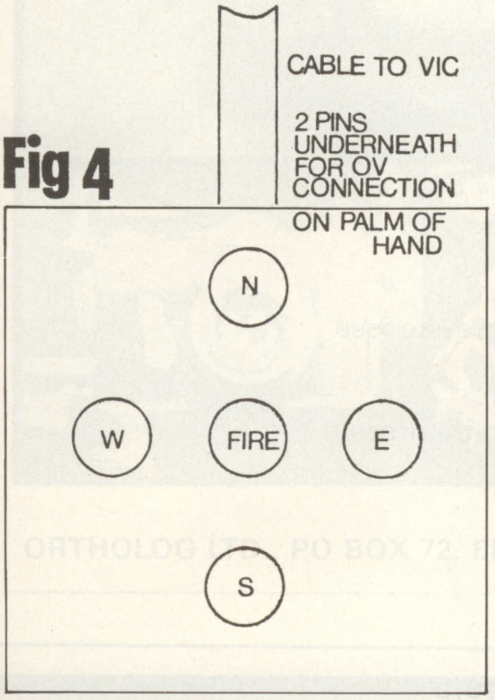
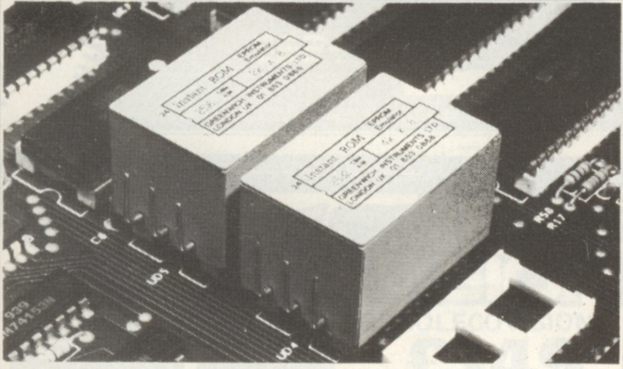
Fig 4



```
READY.

 10 REM  ******************
 20 REM  *       BLOBS       *
 30 REM  *  M.G. PICKFORD  *
 40 REM  *      1983       *
 50 REM  ******************
100 Q=7680:C=30720:N=81:M=87
110 TI$="000000"
120 S=7689:F=7787:D=7688:G=7788:CC(0)=2:CC(1)=6
130 REM S=MAN1NEW D=MAN1OLD  F=MAN2NEW G=MAN2OLD
140 POKE37138,0:POKE36878,10
150 PRINT"□";
160 GOSUB680
170 S=(RND(1)*505)+Q:F=(RND(1)*505)+Q
180 POKED,81:POKED+C,CC(0)
190 POKEG,81:POKEG+C,CC(1)
200 A=PEEK(37136)
210 X=(AOR240)-240
220 IFX=15THEN740
230 IFX=0THEN260
240 X=(LOG(X)/LOG(2))+1
250 ONXGOTO360,370,380,390
260 IFS>8185THENS=8185
270 IFS<7680THENS=7680
280 POKE36875,0
290 X=(AOR15)-15
300 IFX=0THEN350
310 IFX=240THEN740
320 X=(LOG(X)/LOG(2))-3
330 POKE36875,A:POKE36875,0
340 ONXGOTO400,410,420,430
350 GOTO440
```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```
360 S=D-1 :POKE36875,144:GOTO260
370 S=D+22:POKE36875,160:GOTO260
380 S=D+1:POKE36875,176:GOTO260
390 S=D-22:POKE36875,192:GOTO260
400 F=G+22:POKE36875,208:GOTO440
410 F=G-1 :POKE36875,224:GOTO440
420 F=G+1:POKE36875,240: GOTO440
430 F=G-22:POKE36875,255:GOTO440
440 IFF>8185THENF=8185
450 IFF<7680THENF=7680
460 POKE36875,0
470 IFS=DTHEN510
480 IFPEEK(S)=90THENGOSUB630
490 IFPEEK(S)=81ORPEEK(S)=87THENPOKES,160:POKESC,0:GOTO580
500 POKES,N :POKED,32:POKES+C,CC(0):POKED+C,1
510 IFF=GTHEN550
520 IFPEEK(F)=90THENGOSUB630
530 IFPEEK(F)=81ORPEEK(F)=87THENPOKEF,160:POKEFC,0:GOTO580
540 POKEF,M :POKEG,32:POKEF+C,CC(1):POKEG+C,1
550 D=S:G=F
560 IFTI$="000015"THENTI$="000000":GOSUB680
570 GOTO200
580 PRINT"♥ONE BLOB HAS EATEN     THE OTHER"
590 PRINT"♥HIT ANY KEY FOR NEW   GAME"
600 FORX=0TO100:POKE36875,(RND(1)*127)+127:NEXT
610 POKE36875,0
620 GOTO150
630 FORX=128TO250STEP5:POKE36875,X:NEXT:POKE36875,0
640 IFM=81THENN=81:M=87:GOTO690
650 N=87:M=81
660 FORX=128TO250STEP5:POKE36875,X:NEXT:POKE36875,0
670 GOTO690
680 POKEH,32
690 POKEH+C,0
700 H=INT(RND(1)*504)+Q
710 FORX=128TO255STEP2:POKE36877,X:NEXT:POKE36877,0
720 POKEH,90:POKEH+C,5
730 RETURN
740 IFX=15THEN770
750 F=(RND(1)*506)+Q
760 GOTO440
770 S=(RND(1)*506)+Q
780 GOTO440
READY.
```

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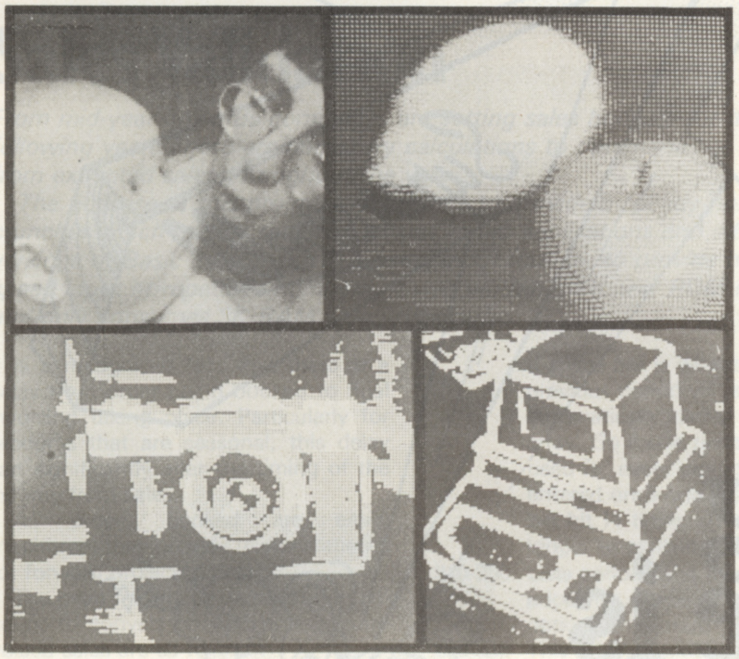

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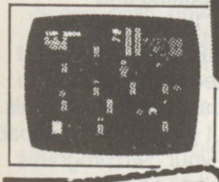

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Sales Validation

From mid-year onwards companies are setting sales budgets for the following year. These are necessary calculations to determine the income from expected sales throughout the year.

The purpose of this program is not only to provide a speedy number cruncher which can be modified to suit varied applications and different versions of Basic but thanks to a novel input routine, to provide high-speed input of repetitive numbers. It was written on a new ROM PET and only consumes 3K RAM when running.

It is a recognised fact that there is a delay from order being booked to final invoicing taking place. Particularly for products that are seasonal, this delay can significantly alter the timing of the income from sales.

As orders booked are easily monitored, they provide useful statistics for forward projected orders.

The main factors to be taken into account to convert booked orders to invoiced sales are as follows:

1. A delay of say one weekfrom receipt of orders to invoicing.
2. Account has to be taken of four or five week months (periods).
3. Anticipated price rises throughout the year.
4. If certain customers pay a lower price because of bulk purchase etc. the net income will be less per annum by a small percentage. A discount factor has to be incorporated to handle this (i.e. −0.3%, −1.2% etc).
5. Individual valuations for various product sizes, variants etc. need to be added together to show group valuation summaries.

See table for example of a typical calculation.

Figure 1 shows a typical valuation for Bloggo soap powder, small and large sizes. An explanation of the listing is as follows:- (*Note* for $ read £).

Line	
55	Disables the run/stop key. It may be omitted if not required.
60	DIM's arrays.
80-84	Input discount factor. If no discounts are given input zero.
90-200	The ASCII code of each key pressed is checked. If it is a number or decimal point it is concatenated to the previous figure. If it is carriage return then value of string at this point is taken. If space bar is detected the previous period value is automatically loaded into the array. So if one price is being used for every period it is entered once and the space bar hit 11 times. (It takes longer to explain than to do).
210-250	Lists periods and relevant prices for checking and option to re-input.
260-330	This pricing calculation is treated separately from the other 11 periods as some of period 12's order this year will actually be invoiced in period 1 next year. Hence, the request for period 12 booked orders. After inputting period 12 and period 1 figures the delivered volume is calculated and period 1 delivered sales shown.
340-470	This loop requests the remaining 11 period booked orders. It checks them for a four or five week month and adjusts how many weeks of one month are added to the next. The delivered volume and sales are then calculated and shown.
480-510	Totals del. volume, booked volume and del. value.
515-536	Prints all results for the product in tabular form.
555-590	You have three options:- 'R' – To re-input current product data. 'A' – Input and calculate another size/variant of the same group. 'T' – Totals all product sizes/variants in a group.
600-620	Lists total period group sales and grand total sales by value.
630-635	Zero array/flags and enables run/stop key. (This may be omitted if not required).
640-650	Option to recalculate another group of products.

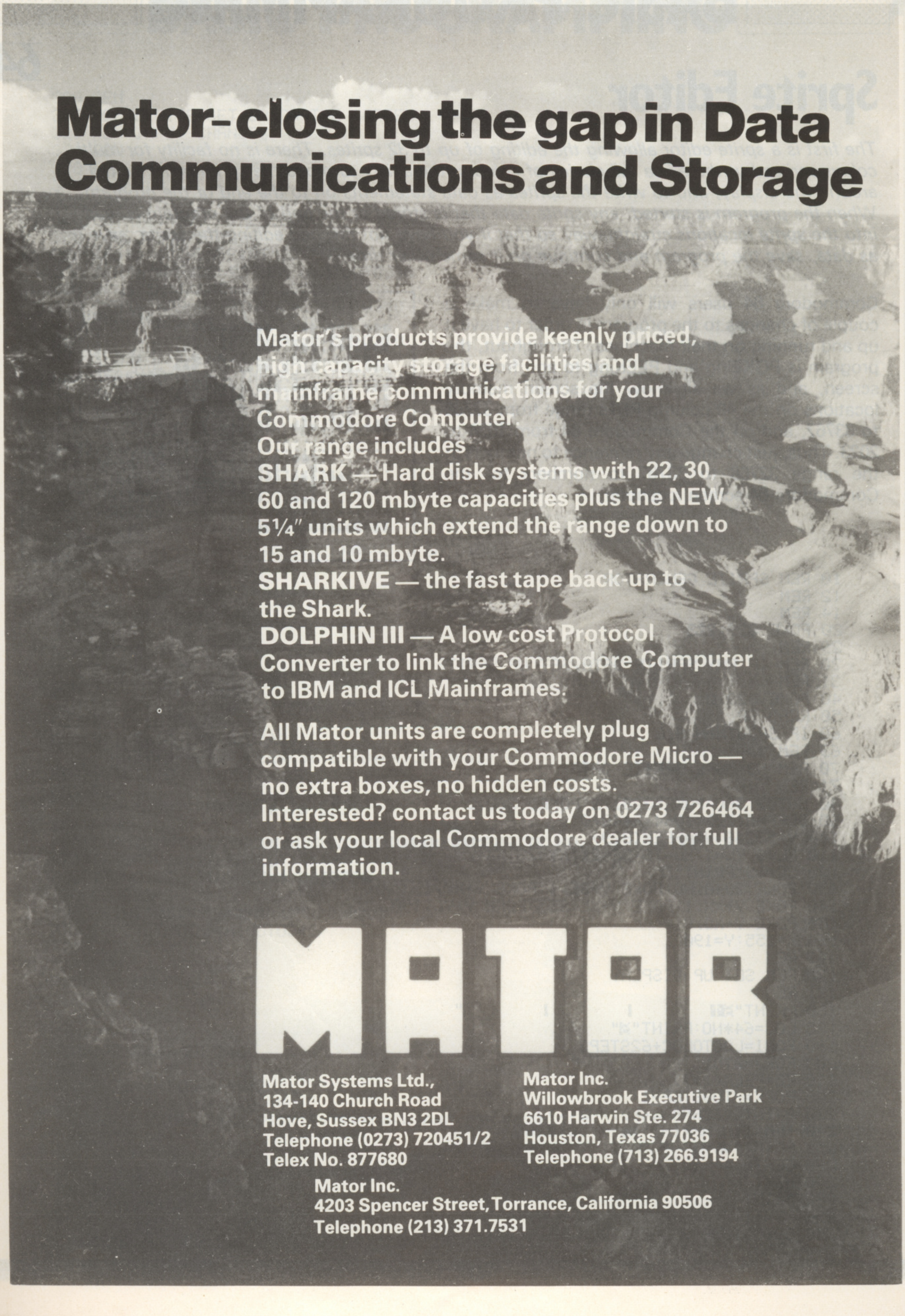
It should be possible to run this program on most micros with Microsoft Basic that allows concatenation of strings. It is also possible to check which key is being pressed by using the appropriate PEEK command if desired instead of checking ASCII code.

Lines 90-200 could easily be rewritten to provide conventional input commands at the expense of speed and would then be almost universally adaptable to all versions of BASIC.

As no special graphics are employed, all the results could be formatted to a printer for a hard copy if desired.

```
5 REM
10 REM SALES VALUATION
20 REM  BY J.CONSADINE 27/7/82
30 REM
40 PRINT"■■■BOOKED ORDERS TO GROSS SALES ($'000'S)"
50 PRINTSPC(9)"■■AT DISCOUNTED PRICE ."
55 POKE144,49:REM DISABLE RUN/STOP KEY
60 DIMA(13),SP(12),BB(12),Z(12),C(12),TS(12)
70 CM=0:AY=0:FORN=1TO12:A(N)=0:NEXT
75 L$="****************************************"
80 INPUT"■■■DISCOUNT FACTOR(0.2,1.3,ETC)■■*■■■■";XX$
82 IFXX$="*"THEN80
84 XX=VAL(XX$):XX=-XX/100
90 PRINT"■■INPUT PRICES FOR EACH PERIOD."
100 PRINT"IF CURRENT PERIOD IS SAME AS LAST PRESS"
110 PRINT"■ SPACE ■ONLY.■"
120 FORN=1TO12
130 PRINT"PERIOD"N"PRICE?"
135 REM CHECK KEY PRESSED & CONCATENATE STRINGS
```

```
140 GOSUB670
150 IFASC(A$)=32THENSP(N)=SP(N-1):PRINT:GOTO200
160 IFASC(A$)=13THENSP(N)=VAL(N$):PRINT:N$="":GOTO200
170 IFASC(A$)=46THENN$=N$+A$:PRINTA$;
180 IF(ASC(A$)>47)AND(ASC(A$)<58)THENN$=N$+A$:PRINTA$;
190 GOTO140
200 NEXT
210 GOSUB660:PRINT"▣▣"
220 FORN=1TO12:PRINT"PERIOD"N" $"SP(N):NEXT
230 PRINT"▣▣TO REINPUT TYPE ▣R■ ,ANY OTHER KEY"
240 PRINT"TO CONTINUE.":GOSUB670
250 IFA$="R"THEN90
260 INPUT"▣▣PER 12 BOOKED VOL(GROSS)▮▮*▮▮▮";B
270 INPUT"▣PER 1 BOOKED VOL(GROSS)▮▮*▮▮▮";BB(1)
280 Z(1)=(B/5)+(BB(1)*3/4):Z(1)=Z(1)*12
290 PRINT"▣PER 1 DEL VOL (DOZ)=";Z(1)
300 SP(1)=SP(1)*(1-XX):E=SP(1)*Z(1)
310 C(1)=INT((E+50)/100)/10
320 PRINT"▣PER 1 DEL SALES= $";C(1)
330 A(1)=A(1)+C(1)
335 REM INPUT REMAINING PERIODS 2-12 VOLUMES
340 FORN=2TO12
350 IFN=3ORN=6ORN=9ORN=12THENK=4/5:GOTO370
360 K=3/4
370 IFN=4ORN=7ORN=10THENL=5:GOTO390
380 L=4
390 GOSUB690
400 PRINT"▣PER"N"BOOKED VOL(GROSS)";:INPUT"▮▮*▮▮▮";BB(N)
410 PRINT"▣"
420 Z(N)=((BB(N-1)/L)+(BB(N)*K)):Z(N)=Z(N)*12
430 PRINT"▣PER"N"DEL VOL (DOZ)=";Z(N)
440 SP(N)=SP(N)*(1-XX):E=SP(N)*Z(N)
450 C(N)=INT((E+50)/100)/10
460 PRINT"▣PER"N"SALES= $";C(N)
470 A(N)=A(N)+C(N):NEXT:GOSUB660
480 FORN=1TO12:CM=CM+Z(N):NEXT
490 PRINT"▣▣PER1-12 DEL'D DOZENS=";CM
500 FORN=1TO12:AY=AY+C(N):NEXT
510 PRINT"▣PER1-12 GROSS SALES= $";AY:GOSUB660:PRINT"▣"
515 REM FORMAT TABLE.
520 DEFFNA(X)=1-LEN(STR$(X))
522 PRINT"▣PER   BKD VOL DLD VOL G/SALES■":PRINT
523 PRINT"▣12";TAB(11+FNA(B));B
530 FORN=1TO12
531 PRINTTAB(2+FNA(N));N;TAB(11+FNA(BB(N)));BB(N);
533 PRINTTAB(11+FNA((N)));Z(N);
534 PRINTTAB(16+FNA(A(N)));A(N):NEXT
535 PRINT"▣TOT.";TAB(18+FNA(CM));CM;
536 PRINTTAB(16+FNA(AY));AY
555 PRINT"▣TO REINPUT TYPE ▣R■."
560 PRINT"▣▣PRESS ▣A■ FOR ANOTHER SIZE/VARIANT"
570 PRINT"▣OR ▣T■ FOR TOTAL PRODUCT SALES.":GOSUB670:PRINT"▣"
580 IFA$="R"THEN70
585 IFA$="A"THENCS=CS+AY:FORN=1TO12:TS(N)=TS(N)+A(N):NEXT:GOTO70
586 IFA$="T"THENCS=CS+AY:FORN=1TO12:TS(N)=TS(N)+A(N):NEXT:GOTO600
590 PRINT"▣":GOTO555
600 FORN=1TO12
610 PRINT"PER"N"TOTAL SALES=$";TS(N):NEXT
620 PRINT"▣PER 1-12 TOTAL PRODUCT SALES=$";CS
630 FORN=1TO12:TS(N)=0:NEXT:CS=0
635 POKE144,46:REM ENABLES RUN/STOP KEY
640 PRINT"▣▣▣PRESS ANY KEY FOR ANOTHER PRODUCT."
650 GOSUB670:PRINT"▣":GOTO70
660 PRINT"▣▣▣PRESS ANY KEY TO CONTINUE"
670 GETA$:IFA$=""THEN670
680 RETURN
690 PRINT"▣▣▣▣"
700 PRINTL$
710 RETURN
```



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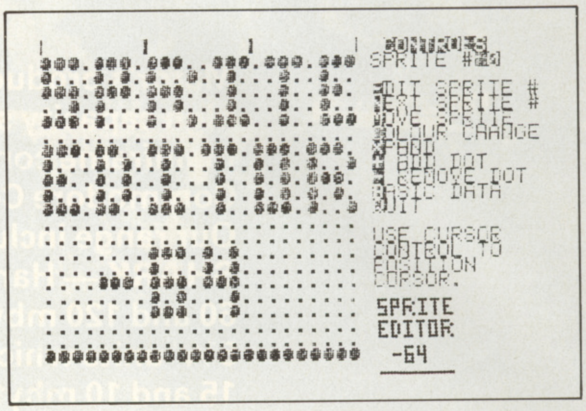
Sprite Editor

The first is a sprite editor allowing the editing of up to 32 sprites. There is no facility for multi-colour sprites but there is a full choice of colours, the ability to move the sprite being edited around the display, and to write the sprites as data statements on to the end of the program. When the program is started, any sprite data that is stored at the end of the program is read into the sprite locations straightaway so that if you have not finished editing the sprite, save it as data, save the program and continue on it some other time.

Commodore 64 users will only have to make a couple of changes to the program in order to have it up and running on their machines. Throughout, the program is POKEing and PEEKing to and from the screen, and as we all know the screen memory locations on the 40 column PETs range from 32768 to 33767, and on the Commodore 64 from 1024 to 2023. Thus, just change any reference to numbers in the range 32768 to 33767 to numbers for the Commodore 64 screen locations.



```
CONTROLS
SPRITE #0
EDIT SPRITE #
NEXT SPRITE #
MOVE SPRITE
COLOUR CHANGE
[illegible]
ADD DOT
REMOVE DOT
BASIC DATA
QUIT
USE CURSOR
CONTROL TO
POSITION
CURSOR.
SPRITE
EDITOR
 -64
```

```
10 REM SPRITE GENERATOR
12 REM
14 REM
20 POKE 829,223
29 REM
30 REM IF ANY SPRITE DATA,SET UP SPRITE
31 REM
40 POKE 828,0
50 READ SP
60 IF SP>0THEN 810
69 REM
70 REM NO MORE SPRITE DATA
71 REM
80 GOSUB 860:POKE53281,2:POKE53280,2
90 DEFFNA(ZZ)=1064+R*40+C
100 V=53248:NO=PEEK(829)
110 XL=0:YL=1:XG=16:SE=21:XY=23:XX=29
120 SC=39:PRINT"□"
130 POKE 2040,NO:POKE V+SE,1:POKE V+XY,1
140 POKE V+XX,1:POKE V+XL,255:POKE V+YL,190
150 POKE V+XG,0
160 X=255:Y=190
169 REM
170 REM SET UP DISPLAY
171 REM
180 PRINT"▓▓        ▌        ▌        ▌"
185 LOC=64*NO:PRINT"▓"
190 FORI=LOCTOLOC+62STEP3
200 FORJ=0TO2
210 ZZ=PEEK(I+J)
220 FORK=7TO0STEP-1
230 A=INT((ZZANDA%(K))/A%(K))
240 IFA=1THENPRINT"▓●";:GOTO260
250 PRINT"▓.";
260 NEXTK
270 NEXTJ
280 PRINT
290 NEXTI
300 GOSUB1000
```

```
309 REM
310 REM SPRITE SET UP ON THE SCREEN
320 REM INPUT CHANGES
321 REM
330 R=0:C=0
340 Z=FNA(0)
350 POKEZ+54272,0
360 GETA$:IFA$=""THEN360
370 POKEZ+54272,1
380 IFA$="Q"THENPRINT"Ɔ":END
390 IFA$="▶I"ANDC=23THEN C=0:GOTO340
400 IFA$="▶I"THENC=C+1:GOTO340
410 IFA$="▮I"ANDC=0THENC=23:GOTO340
420 IFA$="▮I"THENC=C-1:GOTO340
430 IFA$="Ɋ"ANDR=20THENR=0:GOTO340
440 IFA$="Ɋ"THENR=R+1:GOTO340
450 IFA$="⅂"ANDR=0THENR=20:GOTO340
460 IFA$="⅂"THENR=R-1:GOTO340
470 IFA$="Ѕ"THENR=0:C=0:GOTO340
480 IFA$="Ɔ"THENGOSUB1150:GOTO340
490 IFA$="+"THEN580
500 IFA$="-"THEN730
510 IFA$="M"THEN1210
520 IFA$="B"THEN1450
530 IFA$="C" THEN 1400
540 IFA$="X"THEN900
550 IFA$="N"ANDNO-223<31THENNO=NO+1:GOTO130
560 IFA$="E"THEN660
570 GOTO 340
574 REM
575 REM ADD POINT
576 REM
580 Z=FNA(0)
590 Z1=PEEK(Z)
600 IFZ1=81THEN340
610 POKEZ,81
620 BYTE=INT(C/8)+R*3
630 BIT=7-(C-INT(C/8)*8)
640 POKEBYTE+NO*64,PEEK(BYTE+NO*64)ORA%(BIT)
650 GOTO 340
654 REM
655 REM INPUT SPRITE # TO EDIT
656 REM
660 INPUT"ЅɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊ▶I▶I▶I▶I▶I▶I▶I▶IЅPRITE NO.        ▮I▮I▮I▮I";S
670 IFS<0ORS>31THEN660
680 IF NO=223+STHENZZ=1:GOTO700
690 NO=223+S
700 PRINT"ЅɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊɊ
710 IFZZ=1THENZZ=0:GOTO340
720 GOTO 130
724 REM
725 REM DELETE POINT
726 REM
730 Z=FNA(0)
740 Z1=PEEK(Z)
750 IFZ1=46THEN 340
760 POKE Z,46
770 BYTE=INT(C/8)+R*3
780 BIT=7-(C-INT(C/8)*8)
790 POKE BYTE+NO*64,PEEK(BYTE+NO*64)AND(255-A%(BIT))
800 GOTO 340
804 REM
805 REM IF ANY DATA, SET SPRITES UP
806 REM
810 LOC=SP*64
820 FOR I=LOC TO LOC+62
830 READ A:POKE I,A
```

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```
840 NEXT I
850 GOTO 50
854 REM
855 REM SET ARRAY WITH POWERS OF TWO
856 REM
860 FOR I=0 TO 7
870 A%(I)=2↑I
880 NEXT I
890 RETURN
894 REM
895 REM INPUT FOR EXPAND
896 REM
900 PRINT"SQQQQQQQQQQQQQQQQQQQQQQQQQQ]]]]]]]]]]RENTER X OR Y"
910 GETA$:IFA$<>"X"ANDA$<>"Y"THEN900
920 IFA$="X"THEN960
930 IFPEEK(V+XY)=1THENPOKEV+XY,0:GOTO980
940 POKEV+XY,1
950 GOTO980
960 IFPEEK(V+XX)=1THENPOKEV+XX,0:GOTO980
970 POKEV+XX,1
980 PRINT"SQQQQQQQQQQQQQQQQQQQQQQQQQQ]]]]]]]]]]"
990 GOTO 340
994 REM
995 REM DISPAY CONTROL OPTIONS
996 REM
1000 PRINT"♥"SPC(26)"RCONTROLS■"
1005 PRINTSPC(25)"SPRITE #R■"NO-223
1010 PRINT:PRINTSPC(25)"QRE■DIT SPRITE #"
1020 PRINTSPC(25)"RN■EXT SPRITE #"
1030 PRINTSPC(25)"RM■OVE SPRITE"
1040 PRINTSPC(25)"RC■OLOUR CHANGE"
1050 PRINTSPC(25)"RX■PAND"
1060 PRINTSPC(25)"R+■ ADD DOT"
1070 PRINTSPC(25)"R-■ REMOVE DOT"
1080 PRINTSPC(25)"RB■ASIC DATA"
1090 PRINTSPC(25)"RQ■UIT"
1100 PRINT:PRINTSPC(25)"USE CURSOR"
1110 PRINTSPC(25)"CONTROL TO"
1120 PRINTSPC(25)"POSITION"
1130 PRINTSPC(25)"CURSOR."
1140 RETURN
1144 REM
1145 REM CLEAR PRESENT SPRITE
1146 REM
1150 FORI=0TO62:POKENO*64+I,0:NEXTI
1160 FORI=0TO20
1170 FORJ=0TO23
1180 POKE1064+I*40+J,46
1190 NEXTJ,I:R=0:C=0
1200 RETURN
1204 REM
1205 REM MOVE SPRITE AROUND SCREEN
1206 REM
1210 PRINT"SQQQQQQQQQQQQQQQQQQQQQQQQQRUSE CURSOR KEYS TO MOVE THE SPRITE,"
1220 PRINT"RRETURN TO RETURN TO EDITING"
1230 GETA$:IFA$=""THEN1230
1240 IFA$="]"ANDX<319THENX=X+2
1250 IFA$="]"ANDX>1THENX=X-2
1260 IFA$="Q"ANDY<254THENY=Y+2
1270 IFA$="]"ANDY>1THENY=Y-2
1280 POKE V+YL,Y
1290 POKE V+XG,INT(X/255)
1300 POKE V+XL,X-INT(X/255)*255
1310 IF A$=CHR$(13)THEN1330
1320 GOTO1210
1330 POKE V+XL,255
```

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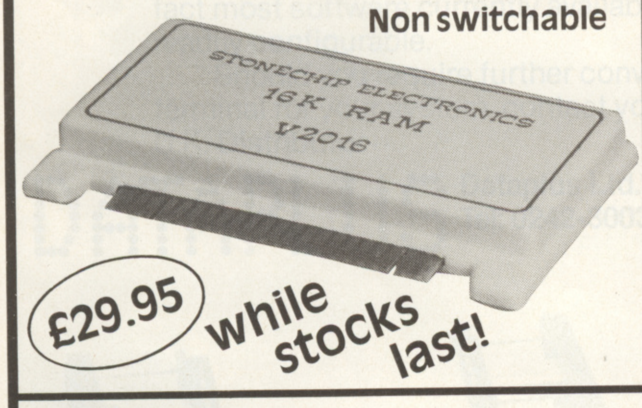

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```
 1340 POKE V+YL,190
 1350 POKE V+XG,0
 1360 X=255:Y=190
 1370 PRINT"SQQQQQQQQQQQQQQQQQQQQQQ
 1380 PRINT"                        S"
 1390 GOTO 340
 1394 REM
 1395 REM CHANGE SPRITE COLOUR
 1396 REM
 1400 INPUT"SQQQQQQQQQQQQQQQQQQQQQQQ]]]]]]]]]]]RCOLOUR,(0-15)        ▌▒▒▒▒▌";CO
 1410 IF CO<0ORCO>15THEN1400
 1420 POKE V+SC,CO
 1430 PRINT"SQQQQQQQQQQQQQQQQQQQQQQQ                                     S";
 1440 GOTO 340
 1444 REM
 1445 REM CREATE DATA STATEMENTS FOR
 1446 REM PRESENT SPRITE
 1447 REM
 1450 PRINT"JQQQ";PEEK(828)+30000;"DATA"RIGHT$(STR$(NO),LEN(STR$(NO))-1)
 1460 POKE828,PEEK(828)+1:FORI=0TO8
 1470 PRINTPEEK(828)+30000"DATA";
 1480 FORJ=0TO6
 1490 BB=PEEK(NO*64+I*7+J)
 1500 BB$=RIGHT$(STR$(BB),LEN(STR$(BB))-1)
 1510 PRINTBB$;",";
 1520 NEXT J
 1530 PRINT"▌ ":POKE828,PEEK(828)+1
 1540 NEXT I
 1550 PRINTPEEK(828)+30000;"DATA-1"
 1560 PRINT"RUN80S"
 1570 POKE 198,12
 1580 FORI=0TO11:POKE631+I,13:NEXT I
 1590 POKE829,NO:END
20000 DATA223
20001 DATA238,231,119,138,146,36,238
20002 DATA226,38,40,162,36,232,151
20003 DATA39,0,0,0,236,238,238
20004 DATA138,68,169,202,68,174,138
20005 DATA68,170,236,228,233,0,0
20006 DATA0,0,0,0,0,234,0
20007 DATA0,138,0,14,238,0,0
20008 DATA162,0,0,226,0,0,0
20009 DATA0,0,0,0,255,255,255
29997 REM
29998 REM SPRITE DATA STORED FROM HERE
29999 REM
30001 DATA -1
READY.
```

Character Editor

The second program is for a character editor for the 64; this program is set up in the same way as the sprite editor except for the colour which cannot be changed. The thing to remember with the character editor is that before you return to review the character that you have created, you must first update the character using the '=' key. This will show the values of each byte of the character as it is updated.

On both programs, the sprite or the character being edited can be cleared by hitting SHIFT CLR/HOME. Also both programs use the cursor keys so there is no need for a joystick. We hope that you will find these two programs very useful.

```
 1 REM CHARACTER BUILDING
 2 REM ************************
 3 REM
 100 REM
 110 REM
 120 REM
 125 REM
 130 POKE 53280,2:POKE 53281,2
 140 PRINT"⊐π               * CHARACTER BUILDING *"
 150 POKE 828,0
 160 RUN 170
 170 CS=12288
 175 POKE 56334,PEEK(56334)AND254:POKE 1,PEEK(1)AND251
 180 FOR I=CS TO CS+2047
 190 POKE I,PEEK(53248+I-CS)
 200 NEXT I
 205 POKE 1,PEEK(1)OR4:POKE 56334,PEEK(56334)OR1
 210 PRINT"⊐5 RUN 280"
 220 PRINT"RUN"
 230 POKE 198,3
 240 POKE 631,19
 250 POKE 632,13
 260 POKE 633,13
 270 END
 280 S=1024:CL=40
 290 CS=12288
 300 CR=0:LN=30000+PEEK(828)
 310 P=24:BG=1:BR=1
 320 POKE 53280,2:POKE 53281,2
 330 DEFFNA(XX)=S+R*2*CL+2*C:REM SCREEN POKE LOCATION
 340 DEFFNB(XX)=8*R+C:REM SCREEN POKE VALUE FOR CHAR
 350 GOTO 1000
 360 PRINT"⊐⊒":GOSUB 1200
 370 PRINT"Ƨ";:FOR I=0 TO 7
 380 PRINT". . . . . . . .":PRINT
 390 NEXT I:F=0
 400 PRINT"Ƨ":R=0:C=0
 410 Z=FNA(0)
 420 IF F=0 THEN 460
 430 IF Z=ZL THEN 450
 440 POKE ZL,IL:ZL=Z:IL=PEEK(ZL)
 450 POKE Z+54272,0
 460 POKE Z+54272,0
 470 GET A$:IF A$="" THEN 470
 480 POKE Z+54272,1
 490 REM
 500 REM CURSOR CONTROL OPTIONS
 505 REM
 510 IF A$="Q" THEN 1500
 520 IF A$="Ⅱ" AND C=7 THEN C=0:GOTO 410
 530 IF A$="Ⅱ" THEN C=C+1:GOTO 410
 540 IF A$="Ⅱ" AND C=0 THEN C=7:GOTO 410
 550 IF A$="Ⅱ" THEN C=C-1:GOTO 410
```

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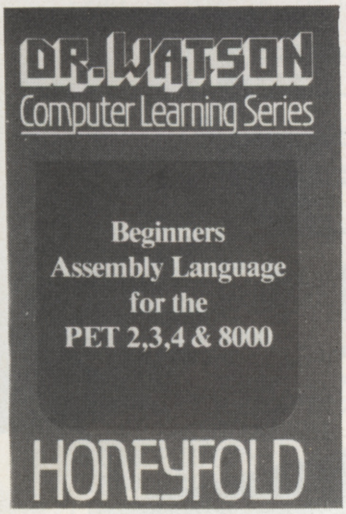
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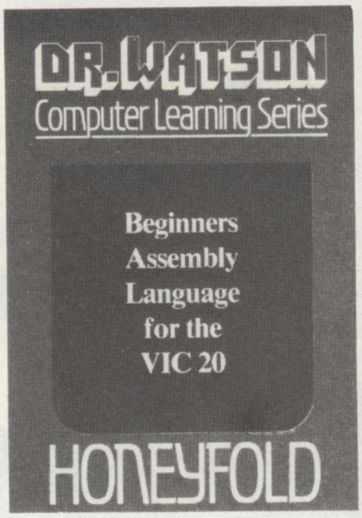
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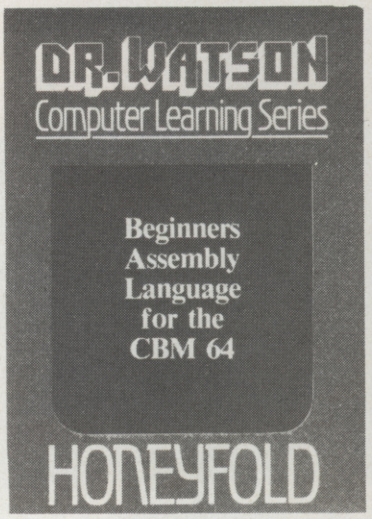
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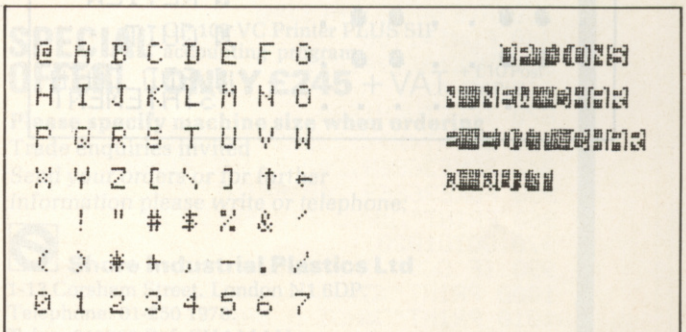
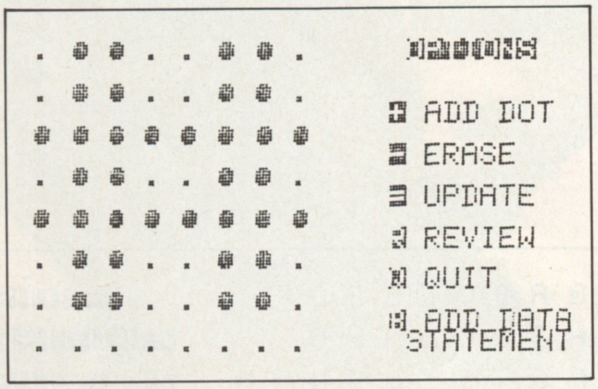
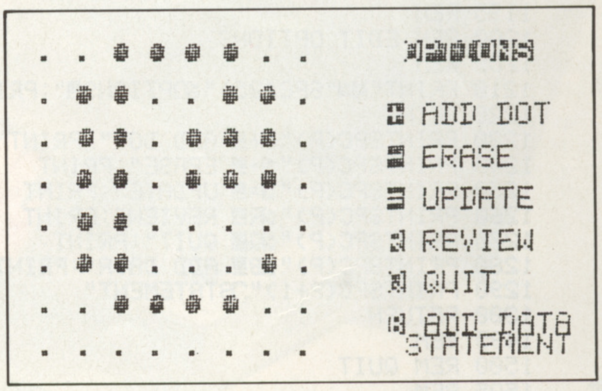
```
560 IF A$="▚" AND R=7 THEN R=0:GOTO 410
570 IF A$="▚" THEN R=R+1:GOTO 410
580 IF A$="▝" AND R=0 THEN R=7:GOTO 410
590 IF A$="▝" THEN R=R-1:GOTO 410
600 IF A$="▞" THEN 400
610 IF F=1 THEN 800
695 REM
700 REM DEFINE NEW CHARACTER OPTIONS
705 REM
710 IF A$="+" THEN POKE Z,81:GOTO 410
720 IF A$="-" THEN POKE Z,46:GOTO 410
730 IF A$="=" THEN 1600
740 IF A$="▝" THEN 370
750 IF A$="R" THEN 1000
760 IF A$="B" THEN 2000
770 GOTO 410
795 REM
800 REM REVIEW CHARACTER SET OPTIONS
805 REM
810 CR=FNB(0)
820 IF A$="N" THEN POKE 53272,21:GOTO 360
830 IF A$="E" THEN POKE 53272,21:F=0:GOTO 1800
840 GOTO 410
995 REM
1000 REM DISPLAY CHARACTER SET OPTIONS
1005 REM
1010 POKE 53272,(PEEK(53272)AND240)+12:R=4:C=0
1020 ZL=FNA(0):IL=32
1030 F=1:PRINT"▝";
1040 PRINT"▚@ A B C D E F G":PRINT
1050 PRINT"H I J K L M N O":PRINT
1060 PRINT"P Q R S T U V W":PRINT
1070 PRINT"X Y Z [ \ ] ↑ ←":PRINT
1080 PRINT"  ! "CHR$(34)" # $ % & ′":PRINT
1090 PRINT"( ) * + , - . /":PRINT
1100 PRINT"0 1 2 3 4 5 6 7":PRINT
1110 PRINT"8 9 : ; < = > ?":PRINT
1120 PRINT"▞"SPC(25)"▚OPTIONS■":PRINT
1130 PRINTSPC(22)"▚N NEW CHAR■":PRINT
1140 PRINTSPC(22)"▚E EDIT CHAR■":PRINT
1150 PRINTSPC(22)"▚Q QUIT■"
1160 BC=PEEK(55296)
1170 GOTO 410
1195 REM
1200 REM EDIT OPTIONS
1205 REM
1210 PRINT"▞▚"SPC(25)"▚OPTIONS■":PRINT
1220 PRINT
1230 PRINTSPC(P)"▚+■ ADD DOT":PRINT
1240 PRINTSPC(P)"▚-■ ERASE":PRINT
1250 PRINTSPC(P)"▚=■ UPDATE":PRINT
1260 PRINTSPC(P)"▚R■ REVIEW":PRINT
1270 PRINTSPC(P)"▚Q■ QUIT":PRINT
1280 PRINTSPC(P)"▚B■ ADD DATA":PRINT
1290 PRINTSPC(P+1)"▝STATEMENT"
1300 RETURN
1495 REM
1500 REM QUIT
1505 REM
1510 REM
1520 POKE 53272,21
1530 POKE 53281,6:POKE 53280,14
1540 PRINT"▝▝    BYE!"
1550 END
1595 REM
1600 REM UPDATE
1605 REM
1610 PRINT"▞";
```



```
@ A B C D E F G
H I J K L M N O
P Q R S T U V W
X Y Z [ \ ] ↑ ←
  ! " # $ % & ′
( ) * + , - . /
0 1 2 3 4 5 6 7
8 9 : ; < = > ?
```

```
 1620 X=CS+8*CR
 1630 FOR R=0 TO 7:SM=0
 1640 FOR C=0 TO 7:D=7-C
 1650 SM=SM-2↑D*(PEEK(FNA(0))=81)
 1660 NEXT C
 1670 POKE X+R,SM
 1680 PRINTSPC(17);SM:PRINT
 1690 NEXT R:R=0:C=0
 1700 GOTO 410
 1795 REM
 1800 REM EDIT CHAR
 1805 REM
 1810 PRINT"▯"
 1820 X=CS+8*CR
 1830 FOR R=0 TO 7:Y=PEEK(X+R)
 1840 FOR C=0 TO 7:Z=FNA(0)
 1850 Q=46:Y=Y*2
 1860 IF Y>255 THEN Q=81:Y=Y-256
 1870 POKE Z,Q:POKE Z+54272,1
 1880 NEXT C,R
 1890 R=0:C=0
 1900 GOSUB 1200
 1910 GOTO 410
 1995 REM
 2000 REM ADD DATA STATEMENTS
 2005 REM
 2010 X=CS+8*CR
 2020 PRINT"▯▩▩▩▩▩▩▩▩"
 2030 PRINTLN;"DATA";
 2040 PRINTRIGHT$(STR$(X),LEN(STR$(X))-1);
 2050 FOR I=X TO X+7
 2060 PRINT",";
 2070 PRINTRIGHT$(STR$(PEEK(I)),LEN(STR$(PEEK(I)))-1);
 2080 NEXT I
 2090 PRINT:PRINT"RUN ▨"
 2100 POKE 828,PEEK(828)+1
 2110 POKE 198,9
 2120 FOR I=0 TO 8
 2130 POKE I+631,13
 2140 NEXT I
 2160 END
READY.
```


```
. ● ● . . ● ● .      OPTIONS
. ● ● . . ● ● .
● ● ● ● ● ● ● ●      ▣ ADD DOT
. ● ● . . ● ● .      ▣ ERASE
● ● ● ● ● ● ● ●      ▣ UPDATE
. ● ● . . ● ● .      ▣ REVIEW
. ● ● . . ● ● .      ▣ QUIT
. . . . . . . .      ▣ ADD DATA
                      STATEMENT
```


```
. . ● ● ● ● . .      OPTIONS
. ● ● . . ● ● .
. ● ● . ● ● ● .      ▣ ADD DOT
. ● ● . ● ● ● .      ▣ ERASE
. ● ● . . . . .      ▣ UPDATE
. ● ● . . . . .      ▣ REVIEW
. . ● ● ● ● . .      ▣ QUIT
. . . . . . . .      ▣ ADD DATA
                      STATEMENT
```

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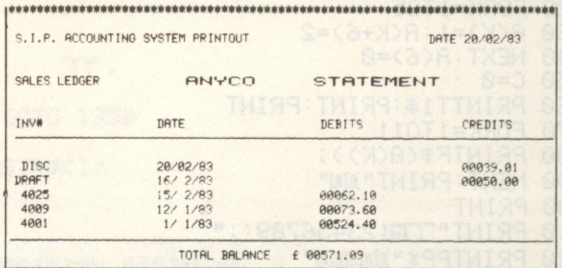

```
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INV#            DATE                 DEBITS          CREDITS

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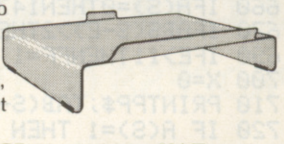

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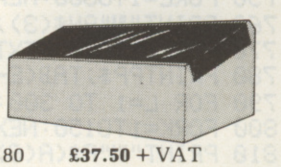

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VIC

Leapfrog

Adapted for the Vic from the PET version the object of this game is to transfer the white frogs to the positions previously occupied by the green and vice versa.

```
10 POKE 56,PEEK(56)-2:POKE 52,PEEK(56)-2:POKE 51,PEEK(55):CLR
20 PRINT"⊐":POKE 36879,42
30 GOSUB 2000
40 POKE 36869,255
100 DIMA(19)
110 F$(0)="  "
120 F$(1)="▮▷"
130 F$(2)="≡▷"
150 AN$(1)="▮?"
160 AN$(2)="≡?"
170 AN$(3)=F$(0)
200 PP$="▧▨▨▨▨"
220 REM
260 T1$="⊐▩⊓    _______________▀"
270 T1$=T1$+CHR$(13)+"     "
280 T1$=T1$+"▩* LEAP - FROG *▀"
520 FORK=1TO5
530 A(K)=1:A(K+6)=2
540 NEXT:A(6)=0
550 C=0
560 PRINTT1$:PRINT:PRINT
570 FORK=1TO11
580 PRINTF$(A(K));
590 NEXT:PRINT"▨▨"
600 PRINT
610 PRINT"⊤⊓123456789:;"
620 PRINTPP$"▨▨▨▨▨"
630 PRINT"≡▩ENTER YOUR MOVE!    - ▀";
640 GOSUB1340:FF=0
650 PRINT"▨":TD=1500
660 IFA(S)=0THEN1470
670 IFABS(S-E)>2THEN1500
690 IFE>11THENFF=1:E=12
700 X=0
710 PRINTPP$;TAB(S-1);
720 IF A(S)=1 THEN PRINTAN$(1);:GOTO750
730 PRINTAN$(2);
750 FORL=1TO500:NEXT
760 PRINT"▮"AN$(3);
770 FORL=1TO50:NEXT
780 PRINTPP$;TAB(E-1);AN$(A(S));
790 FOR L=1 TO 300:NEXT L
800 FORK=1TO150:NEXT
810 PRINT"▮"F$(A(S));
820 C=C+1
830 A(E)=A(S):A(S)=0
840 FORI=1TO6
850 X=X+A(I)*10↑I
860 NEXT
870 IFFFTHEN1600
880 IFINT(X)<>222220THEN620
940 POKE36869,240:PRINT"▨▨▨▨▨▨▨":IFC<60THEN990
950 POKE36869,240:PRINT"▩⊐≡_____________________"
960 PRINT"⊐▩YOU FINISHED, AT      LAST!!!"
970 GOTO1020
990 IF C<50 THEN1060
1000 PRINT"▩⊐≡__________________"
1010 PRINT"⊐▩NOT A BAD RESULT!!!"
1020 PRINT"▨YOU NEEDED"C"MOVES     TO SOLVE THE PROBLEM"
1030 PRINT"YOU REALLY SHOULD DO  BETTER!!"
```

```
1040 GOTO1240
1060 IFC<40THEN1120
1070 PRINT"▧◘≡──────────────────────────"
1080 PRINT"▧VERY WELL DONE!!!"
1090 PRINT"▨YOU SUCCEEDED TO      COMPLETE THE GAME IN"
1100 PRINT"ONLY"C"MOVES - AN       ABOVE AVERAGE RESULT!":GOTO1240
1120 IFC=35THEN1190
1130 PRINT"▧◘≡──────────────────────────"
1140 PRINT"⁆▧EXCELLENT!! YOU ARE A REAL EXPERT!!!"
1150 PRINT"▨YOU HAVE DONE IT IN   ONLY"C"MOVES, THIS"
1160 PRINT"IS ALMOST THE BEST POSSIBLE RESULT."
1170 GOTO1240
1190 PRINT"▧◘≡──────────────────────────"
1200 PRINT"⁆▧CONGRATULATIONS!      NOBODY CAN DO IT      BETTER"
1210 PRINT"▨YOU COMPLETED THE GAMEIN 35 STEPS."
1220 PRINT"THIS IS THE ABSOLUTE  MINIMUM."
1240 PRINT"▨▨WOULD YOU LIKE TO PLAY AGAIN ? (Y/N)"
1250 GETA$:IFA$<>"Y"ANDA$<>"N"THEN1250
1260 IFA$="Y"THENPOKE36869,255:GOTO520
1261 POKE 56,PEEK(56)+2
1262 POKE 36869,240
1263 POKE 36879,27
1270 PRINT"▨▨THANKS FOR PLAYING    'LEAP-FROG' -"
1280 END
1340 POKE198,0
1350 DEL=0:PRINT"⁆"
1360 PRINTTAB(23);"▧FROM                  ⁆⁆";
1370 PRINTTAB(28);"▧ ▩▮";
1380 GOSUB1820:IF DEL THEN PRINT"⁆";:GOTO 1350
1390 S=VAL(C$):PRINT"▧ TO  ▩▮";
1400 FOR I=1 TO 11:IF A(I)=0 THEN C$=STR$(I)
1401 NEXT
1402 PRINT"▮▧"C$;
1410 E=VAL(C$):RETURN
1470 PRINT"▧≡◘THERE IS NOBODY AT    POSITION #"S"▮.▨"
1480 PRINT"▧PLEASE TRY AGAIN!":GOTO1560
1500 PRINT"▧≡◘HEY, I CANNOT JUMP    THAT FAR!!"
1560 TD=3000
1570 FORK=1TOTD:NEXT
1580 TD=3000:GOTO560
1600 PRINTPP$;TAB(11);F$(0);"⁆";
1610 PRINTF$(A(E));
1620 A$="%#*%!!▮▮▮▮▮▮▮"
1630 PRINT"▨▨▨▨";TAB(12);
1640 FORK=1TO20
1650 PRINT"▧"A$;:A=SIN(3)
1660 PRINT"▩"A$;:A=SIN(3)
1670 NEXT:PRINT"          ▨▨▨▨▨"
1680 PRINT"────────────────────────────"
1690 PRINT"▧NOW LOOK WHAT YOU HAVE DONE!!"
1700 PRINTPP$;"⁆";TAB(34);AN$(0);
1710 FORK=72TO0STEP-4
1720 PRINTF$(A(E));"▮";AN$(0);
1730 FORL=1TOK:NEXT
1740 PRINTF$(0)+"▮▨";
1750 NEXT:A(12)=0
1760 PRINTF$(0);"⁆⁆⁆⁆⁆⁆":GOTO1240
1820 GETC$:IFC$=""THEN1820
1830 IFC$=CHR$(20)THENDEL=1:RETURN
1840 IFC$<"1"ORC$>"9"THEN1820
1850 PRINT"▧"C$;:IFC$<>"1"THENRETURN
1860 IFA(8)*A(9)*A(10)*A(11)THENRETURN
1870 PRINT"▧ ▩▮";
1880 GETCC$:IFCC$=""THEN1880
1890 IFCC$=CHR$(20)THENDEL=1:RETURN
1900 IFCC$<"0"ORCC$>"1"THEN1880
1910 C$=C$+CC$:PRINT"▧"CC$;:RETURN
2000 FOR I=1 TO 15
```

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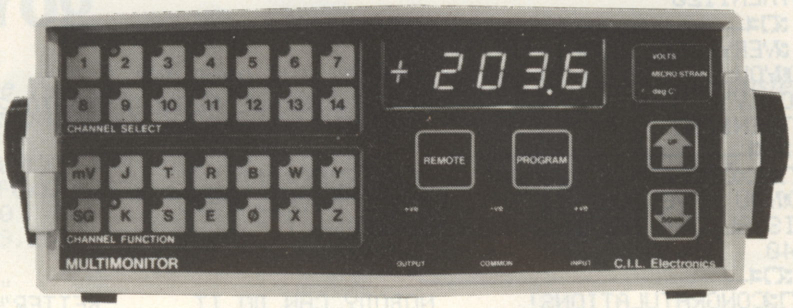

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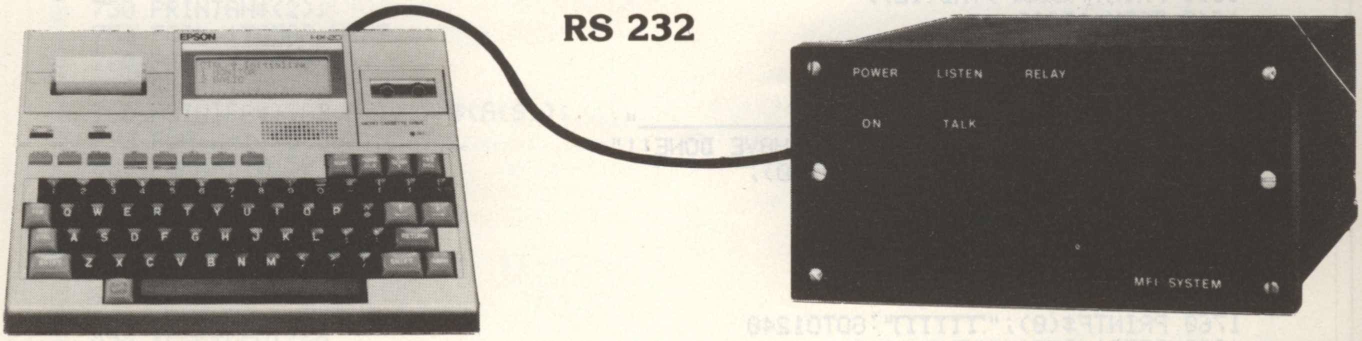

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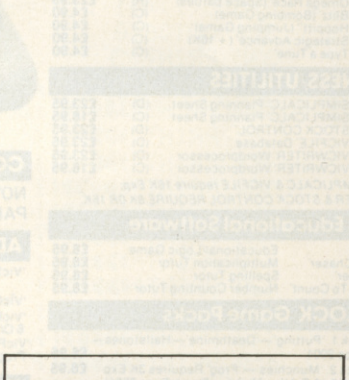
```
2010 READ X
2020 FOR J=0 TO 7
2030 READ K
2040 POKE X+J,K
2050 NEXT J,I
2060 RETURN
2100 DATA 7424,0,0,0,0,0,0,0,0
2101 DATA 7560,16,48,16,16,56,0,0,0
2102 DATA 7568,56,8,56,32,56,0,0,0
2103 DATA 7576,56,8,56,8,56,0,0,0
2104 DATA 7584,40,40,60,8,8,0,0,0
2105 DATA 7592,56,32,56,8,56,0,0,0
2106 DATA 7600,56,32,56,40,56,0,0,0
2107 DATA 7608,56,8,16,16,16,0,0,0
2108 DATA 7616,56,40,56,40,56,0,0,0
2109 DATA 7624,56,40,56,8,56,0,0,0
2110 DATA 7632,46,106,42,42,126,0,0,0
2111 DATA 7640,36,108,36,36,126,0,0,0
2112 DATA 7664,24,189,255,60,126,66,195,0
2113 DATA 7672,153,189,126,60,126,66,66,195
2114 DATA 7552,56,40,40,40,56,0,0,0
READY.
```

Arrow

VIC

This Vic program was adapted from the PET version, which appeared in the December issue of this magazine. Dexterity is required to steer the arrow safely through the point scoring blocks without hitting the sides of the game.

```
10 REM ARROW
20 REM ************************************
30 REM
34 REM
35 REM FIND START OF SCREEN AND COLOUR MEMORY MAPS
36 REM`
40 VR=PEEK(648)*256
50 KR=38400:IFVR<>7680THENKR=37888
60 GOSUB770
70 POKE828,0
80 DIMP(80)
90 KL(1)=1:KL(2)=3:KL(3)=5:KL(4)=7:S=0
100 FORI=1TO4:READA$(I):NEXT:DATAB,F,H,T
110 D(0)=22:D(1)=60:D(2)=62:D(3)=30:T6=3599
120 T9=VR
130 CS=VR
140 C1=22  :REM SCREEN WIDTH
144 REM
145 REM DISPLAY BORDER AROUND SCREEN
146 REM
150 PRINT"☰▢  SCORE: 0   TOP"PEEK(828);
160 PRINT"▔S▩●●●●●●●●●●●●●●●●●●●●●●";
170 FORI=1TO20
180 PRINT"●                    ●";:NEXT
190 PRINT"●●●●●●●●●●●●●●●●●●●▐▌▐▌▐▌●S┐"
194 REM
195 REM·SET TIME TO ZERO AND PLAY GAME
196 REM
200 V=15:H=10:V1=0:H1=-1
210 P2=10:D1=1:TI$="000000"
220 PRINT"▩";RIGHT$(TI$,2):IFTI>T6GOTO580
230 GETZ$:IFZ$=""THEN280
240 Z=50:FORY=1TO4:IFZ$=A$(Y)THENZ=Y-1:Y=5
250 NEXT:IFZ<>INT(Z)ORZ<0ORZ>3GOTO280
260 D1=Z:D=Z-1.5:V1=INT(ABS(D))*SGN(D)
```



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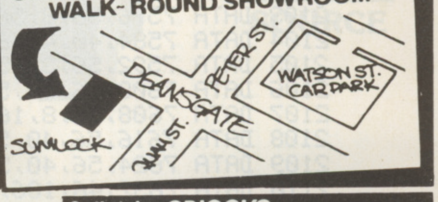

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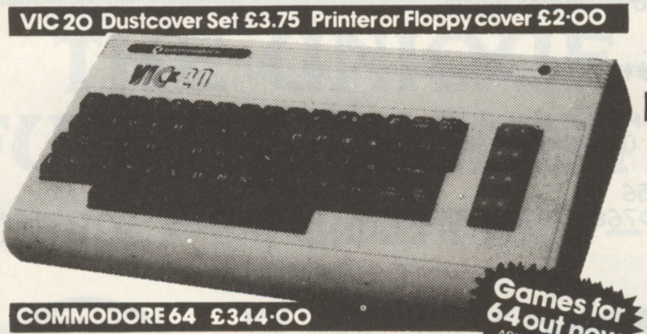

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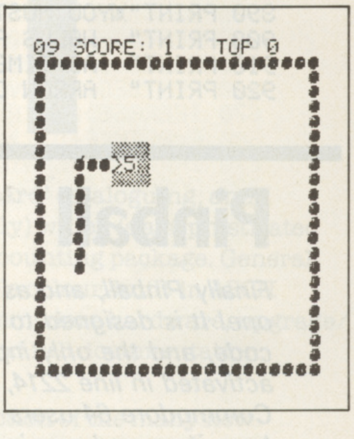

```
09 SCORE: 1    TOP 0
```

```
270 H1=SGN(D)-V1
280 V=V-V1:H=H+H1:GOSUB740
290 P=CS+V*C1+H:KL=INT(RND(1)*4+1):KL=KL(KL)
300 POKEKR+V*C1+H,KL
310 P9=PEEK(P)
320 R6=R7:R7=R7+1:IFR7>P2THENR7=0
330 P1=P(R7):P(R7)=P
340 IFP1<>0THENPOKEP1,32:POKEP1-CS+KR,7
350 POKEP,D(D1):P1=P(R6):IFP1<>0THENPOKEP1,81
360 IFP9<>32GOTO490
370 IFRND(1)>.05THEN220
380 FORV3=V2-1TOV2+1:P3=V3*C1+T9
390 FORH3=H2-1TOH2+1:IFPEEK(P3+H3)<>102GOTO410
400 POKEP3+H3,32
410 NEXTH3,V3:T=0:POKEP8,32
420 V2=INT(RND(1)*18)+3:H2=INT(RND(1)*19)+2
430 FORV3=V2-1TOV2+1:P3=V3*C1+T9
440 FORH3=H2-1TOH2+1:IFPEEK(P3+H3)<>32GOTO420
450 NEXTH3,V3:FORV3=V2-1TOV2+1:P3=V3*C1+T9
460 FORH3=H2-1TOH2+1:POKEP3+H3,102
470 NEXTH3,V3:T=9*RND(1):P8=V2*C1+H2+T9
480 POKEP8,49+T:GOTO220
490 IFP9<>102THEN550
500 T$=TI$
510 T=T-1:S=S+1:POKEP8,T+49
520 PRINT"▓▌▌▌▌▌▌▌▌▌";S
530 GOSUB690:IFT>=0THEN510
540 P2=P2+1:TI$=T$:GOTO380
544 REM
545 REM HIT WALL OR YOURSELF
546 REM
550 POKE36877,220:FORL=15TO0STEP-1:POKE36878,L
560 FORM=1TO300:NEXT:NEXT
570 POKE36877,0:POKE36878,0
580 IFS<=PEEK(828)THEN610
590 PRINT"▚▩▩▩≡NEW HIGH SCORE"
600 PRINT"▩"S"POINTS.":POKE828,S:GOTO 630
610 PRINT"▚▩▩▩≡HIGH SCORE IS";PEEK(828);
620 PRINT"▌.":PRINT"▩▩YOU GOT :"S"▌.
630 PRINT"▩▩▩ANOTHER GO (Y/N) ?
640 GETZ$:IFZ$=""THEN640
650 IFZ$="Y"THENRESTORE:PRINT"▚":GOTO90
660 IFZ$<>"N"GOTO640
670 PRINT"▚▩";:POKE36879,27:END
680 REM MUSIC
690 POKE36878,15:FORL=200TO240:POKE36876,L
700 FORM=1TO5:NEXT:NEXT
710 POKE36878,0:POKE36876,0
720 :
730 RETURN
740 POKE36878,15:POKE36876,220
750 FORL=1TO5:NEXT:POKE36876,0
760 RETURN
764 REM
765 REM INSTRUCTIONS
766 REM
770 POKE36879,42
780 PRINT"▚▜  *** VIC ARROW ***"
790 PRINT"▩YOU ARE AN ARROW"
800 PRINT"  MOVING AROUND THE"
810 PRINT"  SCREEN.TRY TO HIT "▪
820 PRINT"  THE BOXES FOR              POINTS."
830 PRINT"▩YOU MOVE WITH :"
840 PRINT"     T    T=UP"
850 PRINT"     |    F=LEFT"
860 PRINT"   F─┼─H  H=RIGHT"
870 PRINT"     |    B=DOWN"
880 PRINT"     B
```

BASIC PROGRAMMING

```
890 PRINT"⊠YOU MUST AVIOD THE"
900 PRINT"  WALLS AND YOURSELF."
910 PRINT"  AS TIME GOES ON THE"
920 PRINT"  ARROW GETS LONGER."
```

```
930 PRINT"⊠YOU HAVE 60 SECONDS."
940 PRINT"⊞HIT ANY KEY TO START■"
950 GETA$:IFA$=""THEN950
960 PRINT"⊐":RETURN
READY.
```

Pinball

PET

Finally Pinball, and as the REM statement in line 150 invites you, you can have a ball with this one! It is designed to work on a Basic 2 or 4 40 column screen, as it is not using any machine code, and the only input required is pressing the '=' key to operate the flippers. This is activated in line 2214, in case you want to use a different key.

Commodore 64 users will only have to make a couple of changes to the program in order to have it up and running on their machines. Throughout, the program is POKEing and PEEKing to and from the screen, and as we all know the screen memory locations on the 40 column Pets range from 32768 to 33767, and on the Commodore 64 from 1024 to 2023. Thus, just change any reference to numbers in the range 32768 to 33767 to numbers for the Commodore 64 screen locations.

```
180 PRINT"⊡⊐⊞***    PINBALL    ***"
190 PRINT"⊠⊠USE '=' KEY TO ACTIVATE FLIPPERS"
200 PRINT"⊠PRESS ANY KEY (EXCEPT ⊞STOP■) TO PUT"
210 PRINT"A NEW BALL IN PLAY"
220 PRINT"⊠⊠HITTING ALL THE ♠ ♥ ♦ ♣  WITH"
230 PRINT"ONE BALL GETS YOU A FREE BALL."
240 PRINT"⊠⊠WATCH THAT YOU DON'T HIT ANY WRONG"
250 PRINT"KEYS, AND WATCH THAT YOU DON'T ABUSE"
260 PRINT"THE '=' KEY, OR YOU'LL TILT THE MACHINE!"
270 PRINT"⊠⊠IF YOU HAVE SOUND, TURN IT ON.":GETX$
280 PRINT"⊠⊠⊠PRESS ⊞SPACE■ TO BEGIN"
290 GETX$:IFX$=""GOTO290
300 B=5
310 D(1)=-1:D(2)=-41:D(3)=-40:D(4)=-39:D(5)=1:D(6)=41:D(7)=40:D(8)=39
320 GOTO610
330 PRINT"⊐        ⊞***■                       ⊞***■    BALLS LEFT"
340 PRINT"▶▶▶▶▶▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁ "
350 PRINT"▶▶▶▶▶⊿/       \O/  ◡     \| "
360 PRINT"▶▶▶▶▶⊿     O              ⊳ "
370 PRINT"▶▶▶▶▶|  O    O     O      | "
380 PRINT"▶▶▶▶▶|                  (|| "
390 PRINT"▶▶▶▶▶⊦                  \|| "
400 PRINT"▶▶▶▶▶⊢                   || "
410 PRINT"▶▶▶▶▶|      OOOOOOO      || "
420 PRINT"▶▶▶▶▶|      |♠♥ ♦♣|    O || "
430 PRINT"▶▶▶▶▶|      O     O      || "
440 PRINT"▶▶▶▶▶⊦                   || "
450 PRINT"▶▶▶▶▶⊢                   || "
460 PRINT"▶▶▶▶▶|   O          O    || "
470 PRINT"▶▶▶▶▶|         *        /|| "
480 PRINT"▶▶▶▶▶|                  \|| "
490 PRINT"▶▶▶▶▶⊾                  /|| "
500 PRINT"▶▶▶▶▶⊓                 ┌⊞ ■| "
510 PRINT"▶▶▶▶▶⊾┐             ΠT /|| "
520 PRINT"▶▶▶▶▶┌─┐  ┌┐     ┌──────|| "
530 PRINT"▶▶▶|   ▒▒ |     |      || "
540 PRINT"▶▶▶▶▶|  \▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒●| "
550 PRINT"▶▶▶▶▶▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁◆ "
570 RETURN
580 PRINT"⊟▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶";S
590 RETURN
600 GOTO600
610 REM START OF GAME************
```

The Six-Four Supplies Company is THE specialist for the Commodore 64. Our range of products in support of this machine includes a wide range of peripherals, devices and software to cover the needs of home and business user alike. We intend to offer an unrivalled selection of products, covering every aspect of using a Commodore 64. Among the latest additions to our list are:

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- 'Free-format' screen editor simplifies source code entries
- FORTH object code and source screens can be intermixed, and the latter accessed by BASIC
- Detailed 140-page manual with examples and BASIC-FORTH conversions
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This is just a small selection of the many new products which we are handling. Vic-20 and PET/CBM versions are available for many of the programs. Our list is being constantly updated to include the best of the newest introductions for the 64. For further details please complete the coupon below and send a large SAE. All customers on our mailing list receive a regular newsletter . . . a wealth of hints and tips are promised in addition to highly competitive products and prices!

64 SOFTWARE WRITERS: The Six-Four Supplies Company is establishing many dealer contacts in the UK, Europe and the USA. If you feel you have produced a truly imaginative program for the 64 we would like to hear from you. We cannot promise you the Earth . . . but the sky's the limit! All types of program are required.

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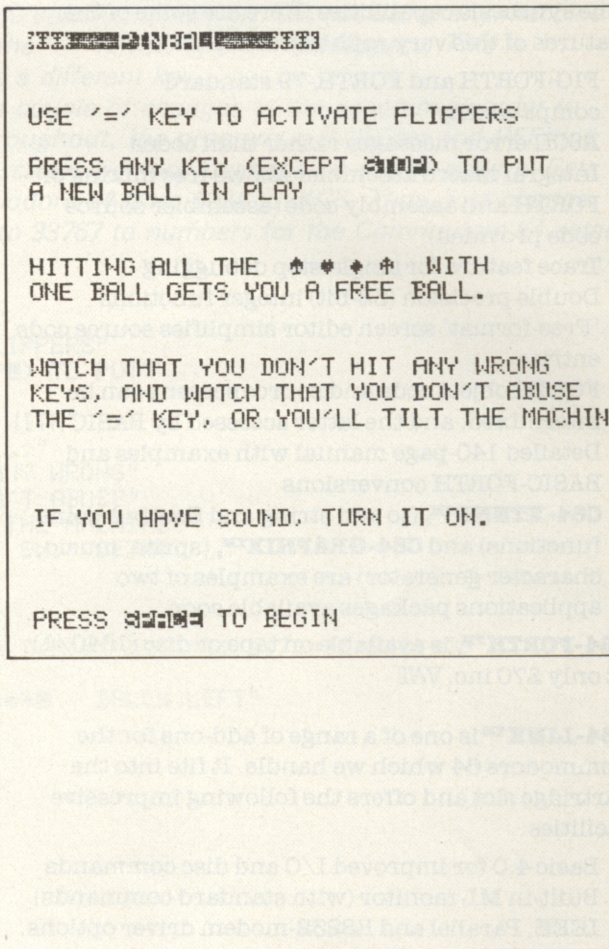
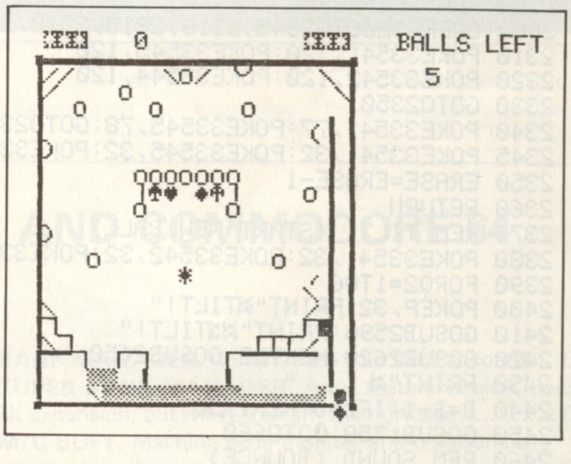
BASIC PROGRAMMING

```
620 GOSUB 330:REM DRAW TABLE
630 GOSUB 580:REM PRINT SCORE
640 IFB=0THEN1950:REM GAME OVER
650 GOSUB 1750:REM NEW BALL
660 REM BEGIN MOVEMENT
670 IFERASE>0THENGOSUB2290
680 F=PEEK(P+DIR):IFF=32THEN2210:REM MOVE
710 IFF<>77THEN810:REM LEFT DIAGONAL
720 GOSUB2460:REM 'BEEP'
730 IFN=1THENN=3:GOTO2210
740 IFN=2THENN=6:GOTO2210
750 IFN=3THENN=1:GOTO2210
760 IFN=4THENN=8:GOTO2210
770 IFN=5THENN=7:GOTO2210
780 IFN=6THENN=2:GOTO2210
790 IFN=7THENN=5:GOTO2210
800 IFN=8THENN=4:GOTO2210
810 REM RIGHT DIAGONAL
820 IFF<>78THEN920
830 GOSUB2460:REM 'BEEP'
840 IFN=1THENN=7:GOTO2210
850 IFN=2THENN=6:GOTO2210
860 IFN=3THENN=5:GOTO2210
870 IFN=4THENN=8:GOTO2210
880 IFN=5THENN=3:GOTO2210
890 IFN=6THENN=2:GOTO2210
900 IFN=7THENN=1:GOTO2210
910 IFN=8THENN=4:GOTO2210
920 REM HORIZONTAL
930 IFF=120THEN960
940 IFF=121THEN960
950 IFF<>64THEN1050
960 GOSUB2460:REM 'BEEP'
970 IFN=1THENN=5:GOTO2210
980 IFN=2THENN=8:GOTO2210
990 IFN=3THENN=7:GOTO2210
1000 IFN=4THENN=6:GOTO2210
1010 IFN=5THENN=1:GOTO2210
1020 IFN=6THENN=4:GOTO2210
1030 IFN=7THENN=3:GOTO2210
1040 IFN=8THENN=2:GOTO2210
1050 REM VERTICAL
1060 IFF=117THEN1090
1070 IFF=118THEN1090
1080 IFF<>93THEN1180
1090 GOSUB2460:REM 'BEEP'
1100 IFN=1THENN=5:GOTO2210
1110 IFN=2THENN=4:GOTO2210
1120 IFN=3THENN=7:GOTO2210
1130 IFN=4THENN=2:GOTO2210
1140 IFN=5THENN=1:GOTO2210
1150 IFN=6THENN=8:GOTO2210
1160 IFN=7THENN=3:GOTO2210
1170 IFN=8THENN=6:GOTO2210
1180 REM SHIFT O,P (79,80)
1190 IFF=79THEN1210
1200 IFF<>80THEN1230
1210 G=INT(RND(1)*3)+2
1220 N=G:GOSUB2460:GOTO2210
1230 REM 102 (SHIFT &) 'BALL DRAIN'
1240 IFF<>102THEN1290
1250 POKE33541,32:POKE33542,32:POKE33544,32:POKE33545,32
1260 POKEP,32:GOSUB2480:REM 'BEEEOUUP!'
1270 S=S+1000:GOSUB580
1280 B=B-1:GOTO640
1290 REM POINT BOUNCES, 87
1300 IFF<>81ANDF<>87THEN1360
1305 POKEP+DIR,168-F
1310 M=120:GOSUB2570
```



```
PINBALL

USE '=' KEY TO ACTIVATE FLIPPERS

PRESS ANY KEY (EXCEPT STOP) TO PUT
A NEW BALL IN PLAY


HITTING ALL THE ♠♥♦♣ WITH
ONE BALL GETS YOU A FREE BALL.


WATCH THAT YOU DON'T HIT ANY WRONG
KEYS, AND WATCH THAT YOU DON'T ABUSE
THE '=' KEY, OR YOU'LL TILT THE MACHINE!


IF YOU HAVE SOUND, TURN IT ON.


PRESS SPACE TO BEGIN
```

```
1320 S=S+100:GOSUB580
1330 G=4:IFF=81THENG=2*INT(RND(1)*2)+3
1340 N=N+G:IFN>8THENN=N-8
1350 GOTO2210
1360 REM CORNER BUMPERS 74,75,76,85
1370 IFF=74THEN1410
1380 IFF=75THEN1410
1390 IFF=76THEN1410
1400 IFF<>85THEN1460
1410 M=55:GOSUB2570:REM 'PLINK'
1420 S=S+50:GOSUB580
1430 G=INT(RND(1)*3)+3:N=N+G
1440 IFN>8THENN=N-8
1450 GOTO2210
1460 REM CARD SUITS 65,83,88,90
1470 REM GET ALL 4 ON 1 BALL
1480 REM TO LIGHT SPECIAL
1490 REM AND GET EXTRA BALL
1500 IFF=65THENA$=A$+"♠":GOTO1550
1510 IFF=83THENA$=A$+"♥":GOTO1550
1520 IFF=88THENA$=A$+"♣":GOTO1550
1530 IFF=90THENA$=A$+"♦":GOTO1550
1540 GOTO1610
1550 S=S+500:GOSUB580
1560 PRINT"■";A$
1570 M=55:GOSUB2570:M=100:GOSUB2570:REM SOUND
1580 SP=SP+1:IFSP=4THENB=B+1:GOSUB2140:P=P+40:GOSUB2110
1590 POKEP+DIR,32
1600 N=7
1610 REM MYSTERY DIRECTION GIZMO *
1620 IFF<>42THEN1730
1630 REM P4=LOCATION *
1640 P4=P+DIR
1650 POKEP,32:REM ERASE BALL
1660 POKEP4,170:M=50:GOSUB2570
1670 POKEP4,42:M=60:GOSUB2570
1680 POKEP4,170:M=70:GOSUB2570
1690 POKEP4,42:M=80:GOSUB2570
1700 N=INT(RND(1)*8)+1
1710 S=S+250:GOSUB580
1720 GOTO2210
1730 N=N+1:IFN>8THENN=N-8
1740 GOTO 2210
1750 REM NEW BALL
1760 PRINT"■ "
1770 PRINT"     ":SP=0
1780 PRINT"     "
1790 P=33633:POKEP,81
1800 A$=""
1810 PRINT"■▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶■■";B
1820 PRINT"■";
1830 GOSUB2090
1840 GOSUB2110
1850 GETB$:IFB$=""THEN1850
1860 N=3:DIR=D(N):POKE33673,32:POKE33713,90
1870 FORT1=1TO250:NEXTT1
1880 POKE33713,32:POKE33753,90
1890 FORT1=1TO500:NEXTT1
1900 POKE33753,32:POKE33713,90
1910 POKE33713,32:POKE33673,90
1920 M=200:GOSUB2460
1930 POKEP,32
1940 RETURN
1950 REM GAME OVER
1960 GOSUB2090
1970 PRINT"■■■■■NEW■■■■GAME?■■■■■■■■(Y,N)"
1980 PRINT"■GAME"
1990 PRINT"■OVER"
2000 FORDEL=1TO200:NEXTDEL
2010 PRINT"■■GAME"
```



```
2020 PRINT"OVER"
2030 FORDEL=1TO250:NEXTDEL
2040 GETE$:IFE$<>"Y"ANDE$<>"N"THEN1980
2050 IFE$="Y"THENRUN
2060 IFE$="N"THENPRINT"▒"
2070 PRINT"OKAY. THANK YOU.▒▒▒▒▒▒▒▒▒"
2080 END
2090 REM EMPTY KEYBOARD BUFFER
2100 FORX9=1TO100:GETQ$:NEXTX9:RETURN
2110 REM RESTORE SUITS
2120 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒♠♥ ♦♣":A$="":PRINT"▒    "
2130 RETURN
2140 REM FREE BALL WHOOP-DE-DOO
2150 FORM=150TO10STEP-10
2160 PRINT"▒▒FREE"
2170 PRINT"BALL":GOSUB2570
2180 PRINT"▒▒▒FREE■"
2190 PRINT"▒BALL■":NEXTM
2200 RETURN
2210 REM MOVE BALL*********
2214 GETX$:IFX$<>"="GOTO2220
2215 IFERASE=0THENERASE=5
2216 GOTO2250
2220 IFX$<>""GOTO2370:REM ***TILT!***
2250 DIR=D(N)
2260 IFPEEK(P+DIR)<>32THENN=N-1:GOTO660
2270 POKEP+DIR,81:POKEP,32:P=P+DIR
2280 GOTO660
2290 REM FLIPPERS
2300 ONERASEGOTO2345,2310,2310,2310,2340
2310 POKE33541,120:POKE33545,120
2320 POKE33542,120:POKE33544,120
2330 GOTO2350
2340 POKE33541,77:POKE33545,78:GOTO2350
2345 POKE33541,32:POKE33545,32:POKE33542,32:POKE33544,32
2350 ERASE=ERASE-1
2360 RETURN
2370 REM TILT! (START NEW BALL)
2380 POKE33541,32:POKE33542,32:POKE33544,32:POKE33545,32
2390 FORQ2=1TO6
2400 POKEP,32:PRINT"▒TILT!"
2410 GOSUB2590:PRINT"▒▒TILT!"
2420 GOSUB2620:NEXTQ2:GOSUB2650
2430 PRINT"▒     "
2440 B=B-1:IFB=0THEN1950
2450 GOSUB1750:GOTO660
2460 REM SOUND (BOUNCE)
2470 POKE59467,16:POKE59466,15:POKE59464,250:GOSUB2650 :RETURN
2480 REM SOUND (BALL DRAIN)
2490 POKE59467,16:POKE59466,15
2500 FORF=30TO150
2510 POKE59464,F:NEXTF:POKE59466,0
2520 FORDEL=1TO250:NEXTDEL
2530 IFB=1THEN2560
2540 POKE59466,15
2550 POKE59464,250:FORDEL=1TO100:NEXT
2560 GOSUB2650:RETURN
2570 REM SOUND (BUMPER)
2580 POKE59467,16:POKE59466,15:POKE59464,M:GOSUB2650:RETURN
2590 REM RASBERRY LOW (TILT)
2600 POKE59467,16:POKE59466,16:POKE59464,200:FORDEL=1TO25:NEXTDEL
2610 GOSUB2650:RETURN
2620 REM RASBERRY HIGH (TILT)
2630 POKE59467,16:POKE59466,15:POKE59464,75:FORDEL=1TO25:NEXTDEL
2640 GOSUB2650:RETURN
2650 REM END ROUTINE (RESET TAPE)
2660 REM SOUND GENERATOR DISABLE
2670 POKE59466,0:POKE59467,0:POKE59468,12:RETURN
READY.
```

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A Programme to Format Basic Listings

It is well-known that a compact Basic program is not easy to read. The main factors causing this are:

(1) BASIC is unstructured;
(2) More than one statement can be put on a line;
(3) Cursor control commands are printed as meaningless characters;
(4) The contents of For/Next loops are not indented.

These make it very difficult to follow the action of a program from a normal listing. This formatter overcomes factors (2) to (4) and provides additional features to improve the appearance and legibility of a listing.

It allows you to write efficient Basic programs with more than one statement per line and without redundant spaces. The formatter does nothing about the structure of your program; that is left to you.

The one remaining snag is that of REMarks. These take up extra RAM and slow down the running of a program. However, they are very necessary to compensate for Basic's limitations of two characters for a variable. If neither speed nor space is important they can be left in. Normal practice is to keep two versions of a program—one for listing with as many remarks as are felt necessary and another for running, stripped of nearly all remarks. This formatter will not help you in getting rid of remarks but it does provide you with more than one way of using one.

The main features of Formatter are:

(1) It is entirely in machine code so there is no loss in printing speed;
(2) Any size of program can be listed as each line is taken from disk into a line buffer, formatted and printed before going on to the next;
(3) Each statement on a line between colons is printed on a separate line;
(4) Redundant spaces, outside REMs and quotes, are removed and replaced by single spaces;
(5) A REM at the end of a line is printed before the operational parts of the line;
(6) Automatic paging with a header consisting of enhanced name, date and page number is printed. The starting page number can be set;
(7) Choice of upper or lower case;
(8) Ability to set left and right margins;
(9) The contents of For/Next loops are indented and multiple Nexts are unscrambled into separate Nexts—(NEXT N,M);
(10) Cursor control characters are printed as (RVS) (OFF) (CLS) (HOM) (CLF) (CRT) (CUP) and (CDN);
(11) Right justification of line numbers;
(12) Ability to choose start and stop line numbers;
(13) Extra line spacing and highlighting with REMs depending on the character immediately after the REM:
    (a) A space will make the printer skip a line before printing the REM line;
    (b) A – will result in the REM line being extended to the right margin with asterisks;
    (c) An = acts as a space but in addition the REM line is printed with double width characters;
    (d) Any other character leads to the REM line being printed as received.

All of this can best be understood by comparing the two listings in Figs. 1 and 2. Fig. 1 is the normal listing of part of a Basic program. Fig. 2 is the same program formatted.

I have used the program extensively without uncovering any bugs. However, it would be foolish to claim that there are none. The program could be made more compact but there is little point unless it is to be put on EPROM.

Formatter has been used with the 3022 and 4022 CBM printers, the 3032 and 3016 PETs and the 4040 disk drives. It will obviously fit into an 8K PET and there should be no problem with a 3040 disk drive. The Hex. listing shown is for the 3000 series, new ROM Pets.

Entering the Program

Type in the two optional lines of BASIC:

```
10 Rem** Formatter 1.0**
20 sys1458:rem$05b2
```

Enter the MLM by typing SYS4 and then .M 05B2 0671 for the first screenful.

Enter each screenful of code, pressing the RETURN key at the end of each line of eight.

Save the complete program by putting a disk in drive zero and typing

```
.S “0:FORMATTER1.0”,08,0401,0DB7.
```

Checking the Program

Type `s=0:fori=1458 to 3510:s=s+peek(i):next:print s`

If 205067 is printed, it is likely that you have correctly entered the program. Otherwise you may use the table below, which has a line for each screenful of code, to help you locate errors. After entering

`s=0:fori=x to y:s=s+peek(i):next :print s`

check whether the correct number has been printed or not. If it has move on to the next line; if not, display the block of code at fault and check it. Re-enter the line to check the entire program and take appropriate action.

The program is not relocatable.

Machine code will not be listed correctly.

```
Block  From  To       x    y     s
-----------------------------------
  1   $05b2-$0671   1458 1649 11883
  2   $0672-        1650 1841 10718
  3   $0732-        1842 2033 22211
  4   $07f2-        2034 2225 21741
  5   $08b2-        2226 2417 24442
  6   $0972-        2418 2609 21488
  7   $0a32-        2610 2801 20043
  8   $0af2-        2802 2993 19078
  9   $0bb2-        2994 3185 22234
 10   $0c72-        3186 3377 19756
 11   $0d32-0db6    3378 3510 11473
```

Using Formatter

Load Formatter into the computer, put the disk containing the program to be listed into either drive and position the paper so that a line of perforations is just above the print head.

After typing RUN or SYS1458, respond to the following prompts. There is no cursor but the normal screen editing facilities are available.

(1) ‘program name?’ — Enter the name or back-arrow to end.
(2) ‘drive?’ — Enter 0 or 1 — defaults to 0.
    At this stage, Formatter checks the existence of the named program. If it is not found, ‘disk error’ is printed and you are returned to (1).
(3) ‘list from line?’ — Enter the desired starting line or 0 to start from the beginning.

(4) 'to line?' — Enter the last required line or a number large enough to include the whole program.
(5) 'left margin?' — Enter any number in the range 0 to 36. I normally use 10.
(6) 'right margin?' — Enter a number at least 40 greater than the left margin, up to 76. I use 76.
If you enter an unusable combination, the message 'margin error' will be displayed and question (5) repeated.
(7) 'first page?' — Usually 1.
(8) 'upper or lower case (u/l)' — Enter u or l.
(9) 'date?' — Up to 15 characters.

Listing will now start. It can be stopped at any time by holding down the STOP key. The current line will be completed before Formatter closes down.

Do not attempt to remove the disk in use while the disk drive LED is on.

One penalty paid for better listings is that more paper is used—a small price for more readable code!

Description

After the various parameters have been entered by the user, the first line of the Basic program is taken from disk and stored in an 80 character long linebuffer. (The first two address bytes of the program are dumped). Successive lines are input until the line number is equal to or greater than the first line to be listed. Should the end of the program be reached before this, Formatter closes down.

The two link bytes are checked for end-of-program before being dumped. The rest of the line from the line number bytes to the final zero are stored in the line buffer.

The characters from the linebuffer are processed and the formatted text for the line is put into a printbuffer ready for printing. The length of the printbuffer is set equal to the right margin. If it is not long enough, the overflow goes into a second printbuffer of the same length. Its contents are printed on the next line.

Each of the three buffers has an associated pointer to keep track of the working position within the buffer.

The linebuffer is scanned twice. On the first pass a REM token is sought. If this is found at the start of the line, the complete line is formatted according to the REM protocol mentioned earlier. The REM line is printed with its line number. However, if the REM is found within the line, the preceding colon is replaced by a zero to simulate end-of-line on the second pass. The REM section is handled as before but without the line number being printed.

In this latter case Formatter is returned to the beginning of the same line to treat it afresh. Of course it will not find a REM this time round. Note that the section before the REM will be printed without a colon at the end.

The two line number bytes are converted into an ASCII string and right justified in a five character field. This is placed at the left margin position in printbuffer1. (At the end of the previous line printing, the two printbuffers would have been cleared).

The first of the text is placed two positions to the right unless modified by a For/Next indentation.

Each byte from the linebuffer is checked to see if it is a zero, colon, for, next, quote, token or none of these.

A zero or colon results in the printbuffers being printed and cleared. If the line ends in a zero, a new line will be input from disk. If a colon occurs, formatting will continue from the colon.

A For will indent the text position of all following lines up to a Next being read. A Next is printed on its own line. A routine checks for Next, NextA, Next B,A etc. The latter is printed on separate lines.

An opening quote results in the

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MACHINE CODE

following bytes in the linebuffer being copied unaltered into a printbuffer unless a print control character is detected. Such a character is decoded from a look-up table to (RVS) etc. A closing quote, colon or end-of-line terminates this.

An opening quote or REM is noted so that shifted characters are left unaltered. Normally bit 7 is removed since the last character of a word in the Token Table is indicated by a shifted character. Colons are also treated as ordinary characters while either of these flags are set.

A long string of cursor control characters and a narrow margin setting can result in the second printbuffer overflowing. Overflow is indicated by a shaded block ( ) being printed at the end of the second line. Since spaces are common in the cursor control strings it was thought prudent not to use (SPC) for this reason.

A token is translated into its corresponding word from the PET's ROM Token Table. A special 'spaces' table is used to decide how many spaces, if any, are to be added to the word:

0 = none
1 = space at front
2 = space at end
3 = space at both ends

Any other character is transferred to a printbuffer with its bit 7 (shift) removed.

After each line is printed, a line counter is updated and, if necessary, a new page taken and a header printed. The header buffer is filled at the start of the program. Only the page number has to be updated and changed into an ASCII string for each new page. It should be remembered that the name is printed double width, and therefore care should be taken to avoid exceeding the width of the paper, and thus upsetting the paging.

The STOP key is checked before each line is processed. Printing will cease when either it is pressed or the upper line number or end of program is reached. A new page is taken and the channels to printer and disk closed. A 'soft start' to keyboard control is finally given.

Memory Usage

$0401 – Basic starter.
$0440 – Buffers—don't have to be saved in program.
$05b2 jump formatter—Can start here with SYS 1458.
$05b5 – Messages.
$0655 – Message table.
$066b – Cursor control table—Token followed by replacement.
$06a1 – Spaces table—for Token words.
$06ec – Formatter routines.
$0a8f – Main Formatter program.
$0db6 End of program.

1

```
.:  05b2 4c 8f 0a 50 52 4f 47 52
.:  05ba 41 4d 20 4e 41 4d 45 3f
.:  05c2 20 00 44 52 49 56 45 3f
.:  05ca 20 00 44 49 53 4b 20 45
.:  05d2 52 52 4f 52 00 4c 49 53
.:  05da 54 20 46 52 4f 4d 20 4c
.:  05e2 49 4e 45 3f 20 00 54 4f
.:  05ea 20 4c 49 4e 45 3f 20 00
.:  05f2 4c 45 46 54 20 4d 41 52
.:  05fa 47 49 4e 20 28 30 29 3f
.:  0602 20 00 52 49 47 48 54 20
.:  060a 4d 41 52 47 49 4e 20 28
.:  0612 37 36 29 3f 20 00 46 49
.:  061a 52 53 54 20 50 41 47 45
.:  0622 23 3f 20 00 4d 41 52 47
.:  062a 49 4e 20 45 52 52 4f 52
.:  0632 00 55 50 50 45 52 20 4f
.:  063a 52 20 4c 4f 57 45 52 20
.:  0642 43 41 53 45 20 28 55 2f
.:  064a 4c 29 20 00 44 41 54 45
.:  0652 3f 20 00 b5 05 c4 05 cc
.:  065a 05 d7 05 e8 05 f2 05 04
.:  0662 06 18 06 26 06 33 06 4e
.:  066a 06 11 28 43 44 4e 29 12
```

2

```
.:  0672 28 52 56 53 29 13 28 48
.:  067a 4f 4d 29 91 28 43 55 50
.:  0682 29 92 28 4f 46 46 29 93
.:  068a 28 43 4c 53 29 1d 28 43
.:  0692 52 54 29 9d 28 43 4c 46
.:  069a 29 00 28 44 55 44 29 00
.:  06a2 02 02 00 00 02 02 02 02
.:  06aa 02 00 02 00 02 00 00 00
.:  06b2 02 02 02 02 02 02 02 00
.:  06ba 02 00 00 00 02 02 02 02
.:  06c2 02 00 00 03 00 01 03 03
.:  06ca 03 03 03 03 00 00 03 03
.:  06d2 00 03 00 00 00 00 00 00
.:  06da 00 00 00 00 00 00 00 00
.:  06e2 00 00 00 00 00 00 00 00
.:  06ea 00 00 20 6f c4 a0 00 b9
.:  06f2 00 02 f0 04 c8 4c f1 06
.:  06fa 60 0a a8 b9 55 06 aa c8
.:  0702 b9 55 06 a8 8a 20 1c ca
.:  070a 60 85 02 20 e2 c9 a5 02
.:  0712 20 fb 06 20 ec 06 60 a9
.:  071a 00 85 1f a9 02 85 20 98
.:  0722 20 97 d6 20 d2 d6 60 85
.:  072a 02 a2 04 20 bc f7 20 e2
```

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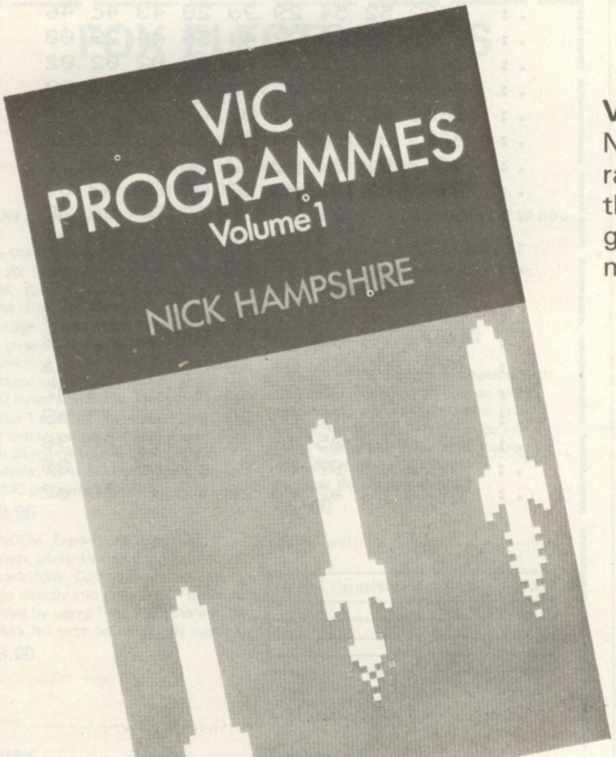

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MACHINE CODE

3

```
.:  0732 c9 20 cc ff e6 a2 20 40
.:  073a 07 c6 02 d0 ec 60 a5 a2
.:  0742 c9 3b b0 01 60 a4 c2 a9
.:  074a 00 a2 03 20 a2 07 a5 c1
.:  0752 38 e5 ce a8 a9 00 99 58
.:  075a 05 88 a2 02 bd a8 05 99
.:  0762 58 05 88 ca 10 f6 a9 58
.:  076a 85 0f a9 05 85 10 a2 04
.:  0772 20 bc f7 20 e2 c9 20 e2
.:  077a c9 a9 00 85 b9 a4 b9 b1
.:  0782 0f f0 08 20 28 f1 e6 b9
.:  078a 4c 7f 07 a9 0d 20 28 f1
.:  0792 20 e2 c9 20 e2 c9 20 cc
.:  079a ff a9 05 85 a2 e6 c2 60
.:  07a2 86 02 20 6d d2 20 e9 dc
.:  07aa a0 01 b9 00 01 f0 04 c8
.:  07b2 4c ac 07 a5 02 88 84 02
.:  07ba 38 e5 02 f0 0f 48 aa ca
.:  07c2 a9 20 9d a8 05 ca 10 fa
.:  07ca 68 a8 d0 02 a0 00 a2 01
.:  07d2 bd 00 01 f0 08 99 a8 05
.:  07da e8 c8 4c d2 07 a6 02 60
.:  07e2 a9 00 85 ab 20 3a 09 a8
.:  07ea 20 3a 09 a2 05 20 a2 07
```

4

```
.:  07f2 a5 b6 18 69 06 a8 a2 04
.:  07fa bd a8 05 91 0f 88 ca 10
.:  0802 f7 a5 c3 85 b9 a9 02 85
.:  080a ab 60 a4 b9 c4 c3 f0 1a
.:  0812 c4 c1 d0 0e b1 0f c9 5f
.:  081a d0 01 c8 a9 00 91 0f 4c
.:  0822 2e 08 a9 00 20 92 08 4c
.:  082a 2e 08 c6 9d a9 b8 85 0f
.:  0832 a9 04 85 10 20 6b 08 a5
.:  083a 9d 30 0b a9 08 85 0f a9
.:  0842 05 85 10 20 6b 08 a6 c3
.:  084a a9 20 9d b8 04 9d 08 05
.:  0852 ca d0 f7 a9 a0 9d b8 04
.:  085a 9d 08 05 a5 d0 e8 9d b8
.:  0862 04 9d 08 05 a9 ff 85 9d
.:  086a 60 a2 04 20 bc f7 a9 00
.:  0872 85 b9 a4 b9 b1 0f c9 00
.:  087a f0 08 20 28 f1 e6 b9 4c
.:  0882 74 08 a9 0d 20 28 f1 20
.:  088a cc ff e6 a2 20 40 07 60
.:  0892 48 84 cb a5 9d 30 19 a4
.:  089a b9 c4 c1 90 08 68 a9 5f
.:  08a2 91 0f 4c e2 08 a9 08 85
.:  08aa 0f a9 05 85 10 4c d1 08
```

5

```
.:  08b2 a4 b9 c4 c1 90 11 68 91
.:  08ba 0f c8 a9 00 91 0f e6 9d
.:  08c2 a5 c3 85 b9 4c e2 08 a9
.:  08ca b8 85 0f a9 04 85 10 a4
.:  08d2 b9 a5 03 05 cc d0 04 68
.:  08da 29 7f 48 68 91 0f e6 b9
.:  08e2 a4 cb 60 a9 00 85 b8 a2
.:  08ea 03 20 70 f7 20 8c f1 c9
.:  08f2 00 d0 02 e6 b8 20 8c f1
.:  08fa c9 00 d0 02 e6 b8 a5 b8
.:  0902 c9 02 d0 04 20 cc ff 60
.:  090a a9 00 85 b8 85 ab 20 8c
.:  0912 f1 a4 ab 91 bf e6 ab 20
.:  091a 8c f1 a4 ab 91 bf e6 ab
.:  0922 20 8c f1 c9 00 f0 09 a4
.:  092a ab 91 bf e6 ab 4c 22 09
.:  0932 a4 ab 91 bf 20 cc ff 60
.:  093a 84 4f a4 ab b1 bf e6 ab
.:  0942 a4 4f 60 85 02 a2 00 bd
.:  094a 6b 06 f0 1e c5 02 f0 08
.:  0952 8a 18 69 06 aa 4c 49 09
.:  095a e8 a9 05 85 02 bd 6b 06
.:  0962 20 92 08 e8 c6 02 d0 f5
.:  096a a9 01 60 85 02 29 7f 85
```

6

```
.:  0972 4f a9 92 85 b1 a9 c0 85
.:  097a b2 a2 00 e4 4f f0 1b a0
.:  0982 00 b1 b1 30 04 c8 4c 83
.:  098a 09 c8 98 18 65 b1 85 b1
.:  0992 a9 00 65 b2 85 b2 e8 4c
.:  099a 7d 09 a6 4f bd a1 06 85
.:  09a2 4f 4a 90 05 a9 20 20 92
.:  09aa 08 a0 00 b1 b1 20 92 08
.:  09b2 b1 b1 30 04 c8 4c ad 09
.:  09ba a5 4f 4a 4a 90 05 a9 20
.:  09c2 20 92 08 60 a9 8f 20 6d
.:  09ca 09 e6 03 a9 00 85 cf 20
.:  09d2 3a 09 c9 3d d0 09 48 a9
.:  09da 01 20 92 08 4c ec 09 c9
.:  09e2 2d d0 02 e6 cf c9 20 d0
.:  09ea 07 48 a9 01 20 29 07 68
.:  09f2 20 92 08 20 3a 09 c9 00
.:  09fa d0 f6 a5 cf f0 0e a5 c1
.:  0a02 38 e5 b9 aa a9 2a 20 92
.:  0a0a 08 ca d0 f8 20 0c 08 c6
.:  0a12 03 60 a5 c3 18 69 03 85
.:  0a1a c3 60 a5 c3 38 e9 03 85
.:  0a22 c3 60 85 d2 84 d3 a9 08
.:  0a2a 85 d4 20 24 f5 60 85 d2
```

MACHINE CODE

7

```
.:  0a32 20 ae f2 20 cc ff 60 a9
.:  0a3a 0f 85 d2 85 d3 a9 08 85
.:  0a42 d4 a9 00 85 d1 20 24 f5
.:  0a4a 20 cc ff 60 a9 0f 20 30
.:  0a52 0a 60 a2 0f 20 70 f7 20
.:  0a5a 8c f1 c9 30 d0 0a 20 8c
.:  0a62 f1 c9 30 d0 03 a9 00 60
.:  0a6a a9 ff 60 a9 03 20 30 0a
.:  0a72 a2 04 20 bc f7 a9 13 20
.:  0a7a 28 f1 a9 0d 20 28 f1 a9
.:  0a82 04 20 30 0a 20 4e 0a 20
.:  0a8a cc ff 4c 89 c3 a9 40 85
.:  0a92 da a9 04 85 db a9 68 85
.:  0a9a bf a9 04 85 c0 20 39 0a
.:  0aa2 20 29 e2 a9 00 20 0b 07
.:  0aaa a2 00 a0 02 bd 00 02 f0
.:  0ab2 0b 9d 54 04 99 40 04 e8
.:  0aba c8 4c ae 0a 86 ce 84 d1
.:  0ac2 ad 54 04 c9 5f d0 03 4c
.:  0aca 6d 0a a9 01 20 0b 07 a2
.:  0ad2 00 bd 00 02 c9 30 f0 02
.:  0ada a9 31 9d 40 04 e8 a9 3a
.:  0ae2 9d 40 04 a9 03 a8 20 24
.:  0aea 0a 20 54 0a f0 13 a9 03
```

8

```
.:  0af2 20 30 0a 20 e2 c9 a9 02
.:  0afa 20 fb 06 20 e2 c9 4c a5
.:  0b02 0a a9 03 20 30 0a a9 03
.:  0b0a 20 0b 07 20 19 07 84 00
.:  0b12 85 01 a9 04 20 0b 07 20
.:  0b1a 19 07 84 bb 85 bc a9 05
.:  0b22 20 0b 07 20 19 07 84 b6
.:  0b2a a9 06 20 0b 07 20 19 07
.:  0b32 84 c1 c0 4d 90 03 4c 43
.:  0b3a 0b 98 38 e5 b6 c9 28 b0
.:  0b42 0b a9 08 20 fb 06 20 e2
.:  0b4a c9 4c 20 0b a9 07 20 0b
.:  0b52 07 20 19 07 84 c2 a9 09
.:  0b5a 20 0b 07 ad 00 02 c9 4c
.:  0b62 f0 04 a9 20 d0 02 a9 11
.:  0b6a 85 d0 a6 c1 a9 20 9d 58
.:  0b72 05 ca d0 fa a9 a0 9d 58
.:  0b7a 05 a5 b6 18 65 ce aa e8
.:  0b82 e8 a9 81 9d 58 05 ca a4
.:  0b8a ce 88 b9 54 04 9d 58 05
.:  0b92 ca 88 10 f6 a9 01 9d 58
.:  0b9a 05 a5 c1 38 e9 07 e5 ce
.:  0ba2 aa a9 50 9d 58 05 e8 a9
.:  0baa 41 9d 58 05 e8 a9 47 9d
```

9

```
.:  0bb2 58 05 e8 a9 45 9d 58 05
.:  0bba a9 0a 20 0b 07 a5 b6 18
.:  0bc2 65 ce 69 06 a8 a2 00 bd
.:  0bca 00 02 f0 08 99 58 05 e8
.:  0bd2 c8 4c c9 0b a9 03 a8 20
.:  0bda 24 0a a9 04 85 d2 85 d4
.:  0be2 a9 00 85 d3 85 d1 20 24
.:  0bea f5 a2 04 20 bc f7 a9 93
.:  0bf2 20 28 f1 a9 0d 20 28 f1
.:  0bfa 20 cc ff a9 00 85 b8 a2
.:  0c02 03 20 70 f7 20 8c f1 20
.:  0c0a 8c f1 20 cc ff 20 e5 08
.:  0c12 a5 b8 f0 03 4c 6d 0a a0
.:  0c1a 01 b1 bf c5 01 90 ee 88
.:  0c22 b1 bf c5 00 90 e7 a2 ff
.:  0c2a 86 9d a2 39 86 a2 a9 09
.:  0c32 18 65 b6 85 c3 a9 03 20
.:  0c3a 29 07 a9 08 85 a2 20 48
.:  0c42 08 a9 02 85 ab 4c 60 0c
.:  0c4a a5 c3 85 b9 20 e5 08 a5
.:  0c52 b8 f0 03 4c 6d 0a 20 01
.:  0c5a f3 d0 03 4c 6d 0a a0 01
.:  0c62 b1 bf c5 bc 90 0c 88 b1
.:  0c6a bf c5 bb 90 05 f0 03 4c
```

10

```
.:  0c72 6d 0a a9 00 85 cc 85 03
.:  0c7a a9 b8 85 0f a9 04 85 10
.:  0c82 a9 02 85 ab a5 c3 85 b9
.:  0c8a 20 3a 09 c9 8f d0 0b 20
.:  0c92 e2 07 e6 ab 20 c6 09 4c
.:  0c9a 4a 0c a0 03 b1 bf f0 14
.:  0ca2 c9 8f f0 04 c8 4c 9e 0c
.:  0caa a9 00 88 91 bf c8 c8 84
.:  0cb2 ab 20 c6 09 20 e2 07 a5
.:  0cba c3 85 b9 a9 00 85 cc 85
.:  0cc2 03 20 3a 09 c9 00 d0 03
.:  0cca 4c a9 0d c9 20 d0 07 a4
.:  0cd2 cc f0 03 4c a3 0d c9 3a
.:  0cda d0 11 a4 cc d0 0d a4 03
.:  0ce2 d0 09 20 92 08 20 0c 08
.:  0cea 4c b9 0c c9 81 d0 0b 48
.:  0cf2 20 14 0a 68 20 6d 09 4c
.:  0cfa c3 0c c9 82 d0 6b 48 a4
.:  0d02 ab b1 bf f0 0c c9 3a f0
.:  0d0a 08 c9 2c f0 28 c8 4c 03
.:  0d12 0d 20 af 0d 68 20 6d 09
.:  0d1a 20 3a 09 c9 00 d0 06 20
.:  0d22 0c 08 4c 4a 0c c9 3a d0
.:  0d2a 06 20 0c 08 4c b9 0c 20
```

MACHINE CODE

11

```
.:  0d32 92 08 4c 1a 0d 68 20 af
.:  0d3a 0d a9 82 20 6d 09 20 3a
.:  0d42 09 c9 00 d0 06 20 0c 08
.:  0d4a 4c 4a 0c c9 3a d0 06 20
.:  0d52 0c 08 4c b9 0c c9 2c d0
.:  0d5a 0a 20 0c 08 a5 c3 85 b9
.:  0d62 4c 38 0d 20 92 08 4c 40
.:  0d6a 0d 48 c9 22 d0 0d a9 01
.:  0d72 45 cc 85 cc 68 20 92 08
.:  0d7a 4c c3 0c 68 a4 cc f0 13
.:  0d82 48 20 45 09 c9 00 f0 04
.:  0d8a 68 4c c3 0c 68 20 92 08
.:  0d92 4c c3 0c c9 80 90 0a c9
.:  0d9a cb b0 06 20 6d 09 4c c3
.:  0da2 0c 20 92 08 4c c3 0c 20
.:  0daa 0c 08 4c 4a 0c 20 1c 0a
.:  0db2 a5 c3 85 b9 60 aa aa aa
```

Fig 1

```
 198 REM-** END OF PREVIOUS SECTION
 199 REM=***** FILE INPUT *****
 200 INPUT"■INPUT FILE  Y■■■";X$:IFX$="N"THENRETURN
 210 PRINT"■■WAIT■":NF$=".DAT."+NM$:REM-** PROCEED
 220 GOSUB1000:REM ** OPEN FILE **
 230 GOSUB2000:IFE1$<>"00"THENCLOSE3:RETURN:REM ** CHECK FILE **
 239 REM ** FILE OK **
 240 FORY=0TONY:IFYH%(Y)=99THEN300:REM ** FOR EACH YEAR HELD **
 250 INPUT#3,NP%(Y)
 260 FORG=1TO5:FORB=1TO14:INPUT#3,N%(Y,G,B):NEXT:NEXT
 290 FORB=1TO14:INPUT#3,B%(Y,B):NEXT:REM ** INPUT #S FOR EACH BAND **
 300 NEXT:CLOSE3:RETURN:REM ** NEXT YEAR OR END **
 309 REM-** NEXT SECTION
READY.
```

Fig 2

```
 198  rem-** end of previous section********************

 199  rem=******  file  input  ******
 200  input "(cdn)input file   y(clf)(clf)(clf)";x$:
      if x$ = "n" then return
      rem-** proceed************************************
 210  print "(cdn)(rvs)wait(cdn)";
      nf$ = ".dat." + nm$

      rem ** open file **
 220  gosub 1000

      rem ** check file **
 230  gosub 2000:
      if e1$<>"00" then close 3:
      return

 239  rem ** file ok **

      rem ** for each year held **
 240  for y = 0 to ny:
         if yh%(y) = 99 then 300
 250     input#3,np%(y)
 260     for g = 1 to 5:
            for b = 1 to 14:
               input#3,n%(y,g,b):
            next
         next

         rem ** input #s for each band **
 290     for b = 1 to 14:
            input#3,b%(y,b):
         next

      rem ** next year or end **
 300  next
      close 3:
      return
 309  rem-** next section**********************************
```

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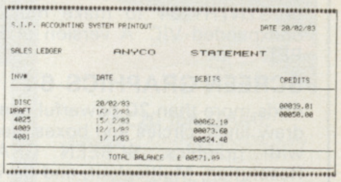

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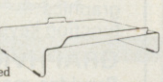

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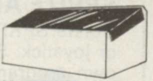

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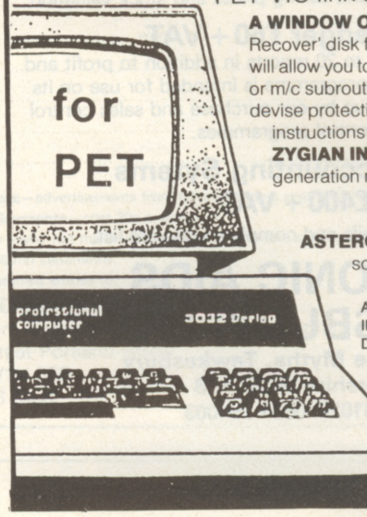

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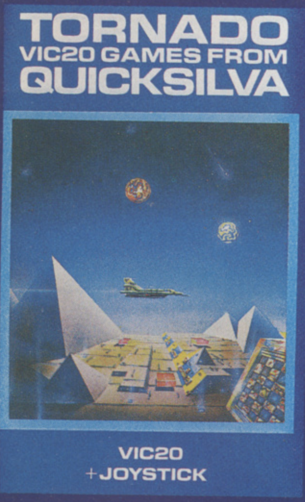
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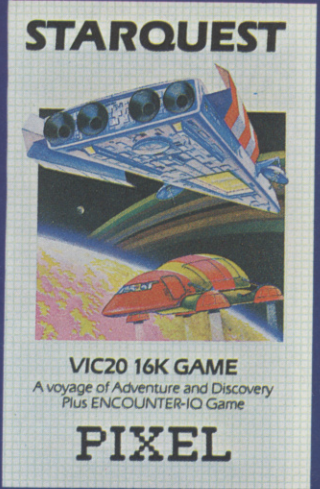
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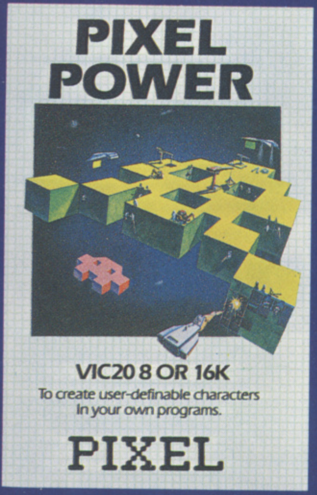
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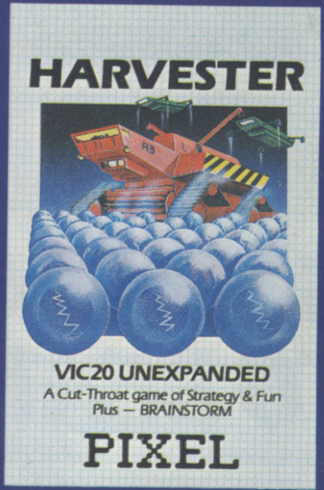
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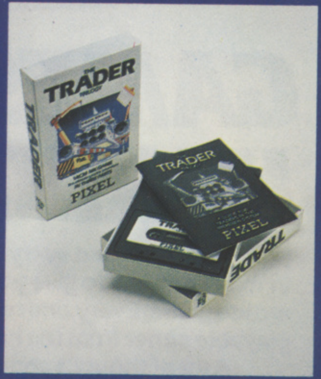
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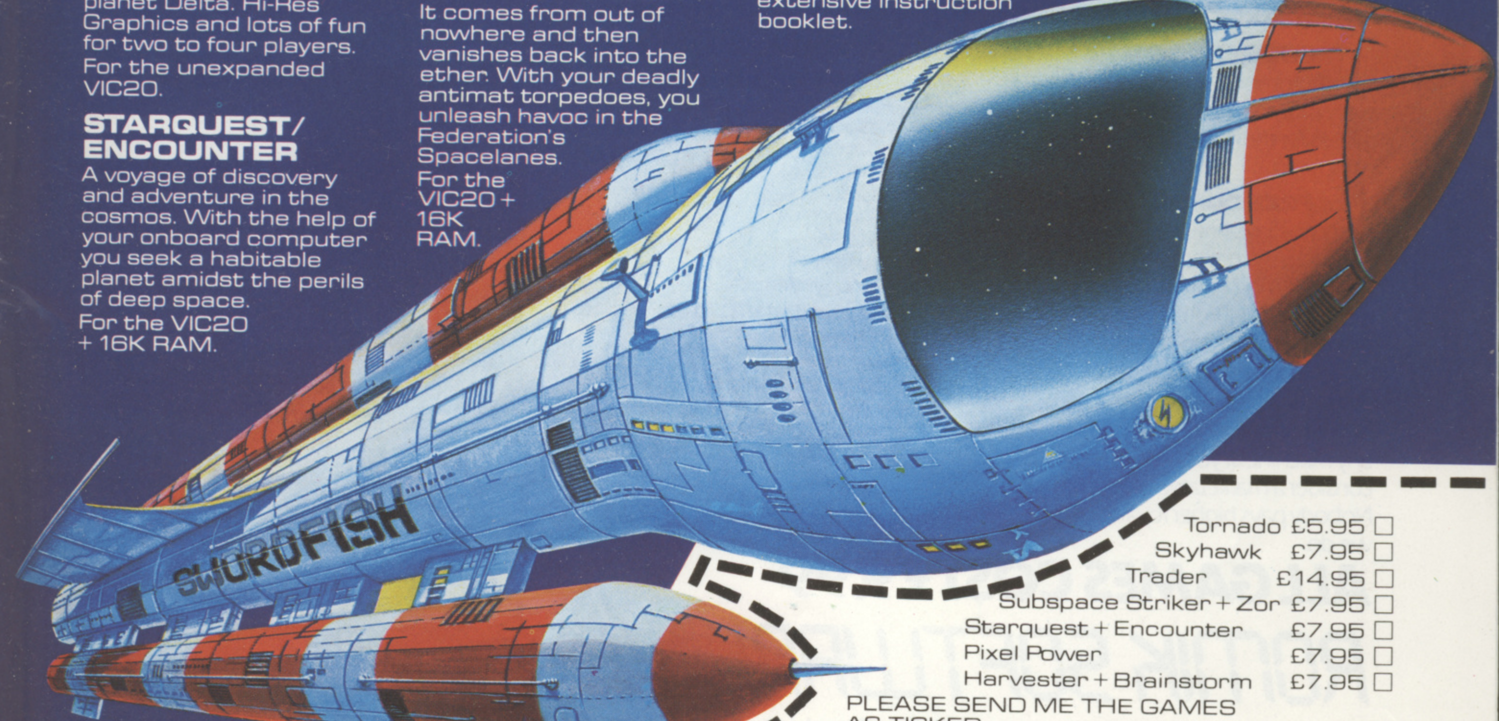

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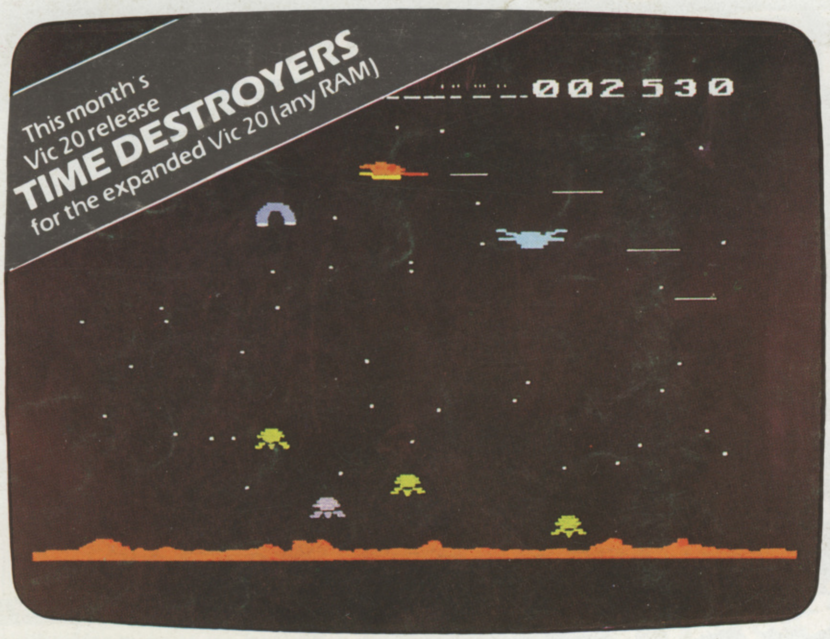
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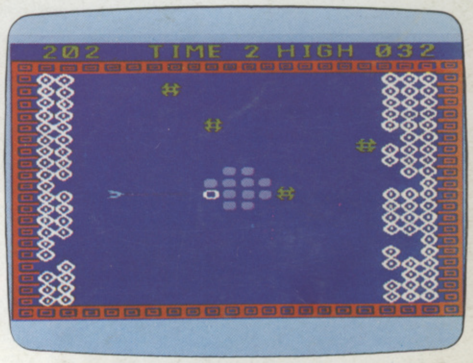

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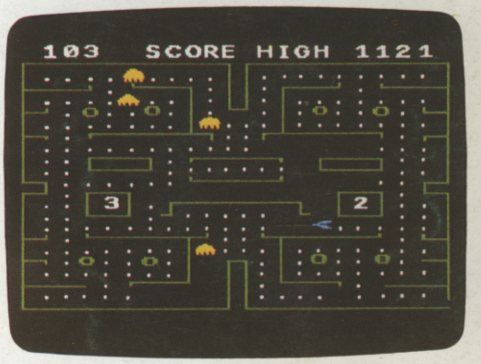

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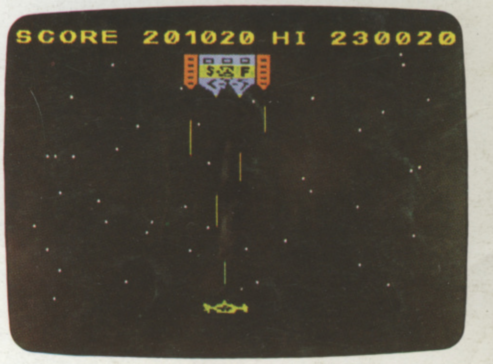

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